*FINAL*
*ADMINISTRATIVE*
*DRAFT*

# *INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR EDWARDS AIR FORCE BASE, CALIFORNIA*

*August 2001*

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# 1.0 INTRODUCTION

## 1.1 PURPOSE AND REQUIREMENT FOR INRMP

As part of their critical defense mission, and for reasons of safety and security, Department of Defense (DoD) installations often encompass large land areas far from concentrations of civilian populations. As a result, many DoD installations contain relatively undisturbed natural resources. The primary objective of the Air Force (AF) natural resources program is to ensure continued access to land and airspace required to accomplish the AF mission by maintaining these resources in a healthy condition (Air Force Instruction [AFI] 32-7064). Conservation of natural resources is important in maximizing effective military testing and training operations (e.g., by providing realistic training environments) and ensuring military readiness. In addition, Federal agencies are subject to compliance with Federal regulations protecting and conserving natural resources. The Sikes Act Improvement Amendments of 1997 (16 United States Code [USC] 670a – 670o) requires the DoD to manage the natural resources of each of its military reservations within the United States and to provide sustained, multiple use of those resources. To meet these goals, the Act requires integrated natural resources management plans (INRMPs) be prepared for military installations. These plans must be developed in coordination with the U.S. Fish and Wildlife Service (USFWS) and the appropriate State fish and wildlife agency, and reflect the mutual understanding of the parties concerning conservation, protection, and management of fish and wildlife resources.

The Sikes Act, as amended in November 1997, requires that INRMPs meet diverse requirements, to include but not limited to:

a. wildlife management, land management, and wildlife-oriented recreation;
b. fish and wildlife habitat enhancement or modifications;
c. wetland protection, enhancement, and restoration where necessary to support fish, wildlife, or plants;
d. integration of, and consistency among, the various activities conducted under the inrmp;
e. public access to the military installation that is necessary or appropriate for sustainable use of natural resources by the public, to the extent that the use is not inconsistent with the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security;
f. enforcement of applicable natural resource laws; and
g. no net loss in the capability of military installation lands to support the military mission of the installation.

The INRMP will also address compliance with the following natural resource legal mandates:

a. Endangered Species Act of 1973;
b. Federal Noxious Weed Act of 1974;

c. Federal Insecticide, Fungicide, and Rodenticide Act;

d. Protection of Wetlands, 1977, Executive Order 11990;

e. Migratory Bird Treaty Act; and

f. Invasive Species, Executive Order 13112

Department of Defense Instruction (DoDI) 4715.3*, Environmental Conservation Program*, requires that INRMPs be developed and implemented for lands that have suitable habitats for conserving and managing natural resources. The development of the plans involves active participation of installation and higher command personnel and coordination with relevant outside authorities. Natural resources management is to be integrated and should follow the principles and practices of ecosystem management and biodiversity conservation. An installation's INRMP is to be reviewed annually, so that it can be updated for the military mission or environmental changes, and it must be revised and approved by the appropriate higher command headquarters at least every 5 years. This DoDI outlines 10 ecosystem management principles and guidelines. These 10 principles form the cornerstone of DoD ecosystem management policy. The 10 ecosystem management principles and guidelines are:

a. maintain and improve the sustainability, and native biological diversity, of the ecosystem;

b. administer with consideration of ecological units and time frames;

c. support sustainable human activities;

d. develop a vision of ecosystem health;

e. develop priorities and reconcile conflicts;

f. develop coordinated approaches to work toward ecosystem health;

g. use the best science available;

h. use benchmarks to monitor and evaluate outcomes;

i. use adaptive management; and

j. implement through installation plans and programs.

The U.S. Air Force has prepared AFI 32-7064*, Integrated Natural Resources Management*, as guidance for the proper management of natural resources on Air Force installations. This INRMP has been prepared in accordance with AFI 32-7064 to identify the types and locations of actions that may affect natural resources, and prioritize those actions required to implement the goals. The INRMP will also supplement the Base General Plan for overall management of Base activities.

An independent review by the U.S. Government Accounting Office (GAO) has identified four practical steps that must be taken before the basic principles of ecosystem management can be implemented (U.S. GAO, 1994). They are ecosystem delineation; use of the best available science; clearly-defined, desired future conditions; and the use of science-based adaptive management.

Our vision is to fully support the Air Force mission by establishing conditions that encourage a self-sustaining, healthy ecosystem that functions naturally with the minimal amount of human interference. The five general measures of success are to:

a. stabilize or increase the desert tortoise population;
b. stabilize or decrease numbers and abundance of exotic species on base;
c. maintain project activities at the nonjeopardy level in consultation with the usfws;
d. stabilize or increase populations of sensitive plant species; and
e. enhance and restore disturbed areas.

## 1.2 PUBLIC ACCESS

The Mojave Desert Ecosystem Program (MDEP) policy is contained within guidelines for interagency agreement established by the Deputy Under Secretary of Defense on April 28, 1995. This policy dictates that the overriding mission of the DoD is the protection of national security. It specifically states that DoD activities in the Mojave Desert are vital to the fulfillment of military missions, and cooperative agreements and their products will not detract from those missions. In establishing the guideline policy, the DoD noted that although conservation is and shall continue to be practiced on military lands, flexibility must be maintained to adapt the defense mission to political and technological development. The policy further states that military lands cannot be used as mitigation for off-installation environmental impacts, but that the DoD will integrate management of natural and cultural resources with military missions in the Mojave Desert Ecosystem.

Edwards AFB has been and will continue to be a limited public access facility due to the sensitive nature of the research and development mission, force protection concerns, flight test operations and the safety hazards associated with flight and test operations. Public access is routinely granted for school and public tours, scientific studies, and to individuals, but this access is allowed on a case-by-case basis and may be revoked on short notice.

## 1.3 DOCUMENT ORGANIZATION

This INRMP has been designed to incorporate all of the elements required under the Sikes Act, the DoDI 4715.3, and AFI 32-7064. Section 1 provides general background information about INRMP requirements and organization. Section 2 provides the management organization, natural resources management activities, and the INRMP implementation process. Section 3 provides an overview of the mission location, current military mission, and a history of land use and management practices on the installation to provide a historic context for the ongoing mission activities and current natural resources management activities. Section 4 describes the natural resources present on Edwards AFB. Sections 5 through 11 present the individual management plans that comprise the INRMP (Table 1-1), focusing on threatened and endangered species, fish and wildlife, forestry, grazing and cropland, pest and land management, and outdoor recreation activities.

**Table 1-1. Management Plans**

| Section | Management Plan |
|---|---|
| 5.0 | Threatened and Endangered Species |
| 6.0 | Fish and Wildlife |
| 7.0 | Forestry |
| 8.0 | Grazing and Cropland |
| 9.0 | Pest Management |
| 10.0 | Land |
| 11.0 | Outdoor Recreation |

# 2.0 MANAGEMENT IMPLEMENTATION

## 2.1 ENVIRONMENTAL MANAGEMENT DIRECTORATE ORGANIZATION

The Environmental Management Directorate at Edwards AFB (Figure 2-1) is responsible for managing environmental planning, conservation, compliance, restoration, and pollution prevention functions. Natural resource management at Edwards AFB is the responsibility of the Conservation Branch within the Plans, Programs, and Conservation Division of the Environmental Management Directorate. The Environmental Management Directorate is responsible for conservation and management of threatened and endangered species, fish and wildlife, forestry, grazing and cropland, research, pest and land management, and certain outdoor recreation activities (such as hunting and fishing). In addition, Environmental Management Directorate personnel coordinate project planning and implementation with other organizations on Base, and review project plans and environmental impact analysis process (EIAP) documentation to ensure compliance with applicable natural resources regulations. It is important that Environmental Management Directorate personnel be included early in the project planning process so they can support the mission by assisting in developing plans that meet management goals for conservation of natural resources in a cost-effective manner. They are also the Air Force's technical experts who consult with the USFWS and coordinate with the California Department of Fish and Game (CDFG) and other regulatory agencies as required. Environmental Management Directorate personnel are responsible for training and educating Base personnel involved in mission requirements affecting the presence and management of natural resources on the Base. They also provide technical support to the public affairs office in providing training and education for on- and off-Base personnel.

## 2.2 NATURAL RESOURCES MANAGEMENT PROCESS

The mechanism in place to ensure proper coordination and planning of on-Base projects include the Air Force's *Environmental Impact Analysis Process*, AFI 32-7061. The preparation and submission of a work request form triggers the EIAP procedures. Preparation of a work request is required by the AFI.

Environmental Management Directorate staff review work requests for each proposed project to determine what level of environmental analysis and documentation is required (i.e., categorical exclusion, environmental assessment, or environmental impact statement). Environmental Management Directorate staff review project plans and EIAP documentation to ensure compliance with the Federal Endangered Species Act and other natural resources regulations. Projects are reviewed by member organizations (Figure 2.2) of the Environmental Protection Committee (EPC) for all projects on Base to ensure that all environmental impacts are identified and considered early in the project planning process and that appropriate mitigations are developed.

At Edwards AFB, the EPC is a tiered entity that ensures appropriate consideration of environmental issues at every level of management. Individual Integrated Process Teams (IPTs) from affected organizations on Base meet and review proposed projects to assure that all

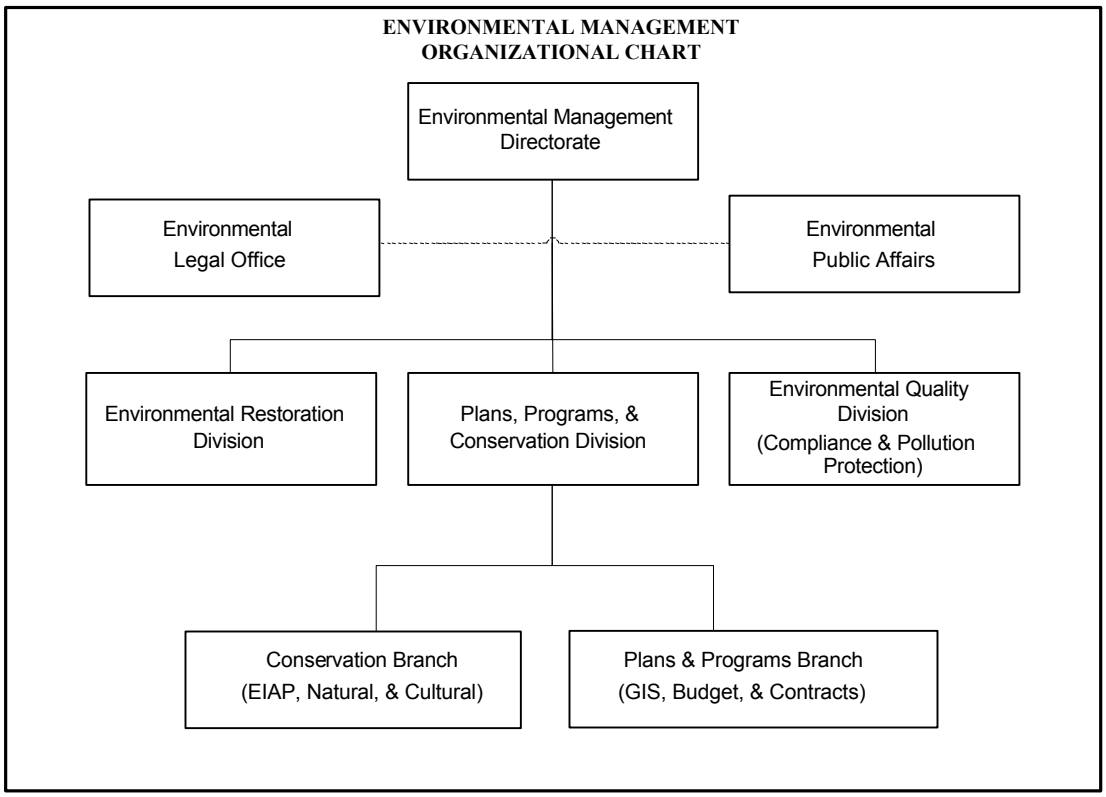


**Figure 2-1. Environmental Management Organization**

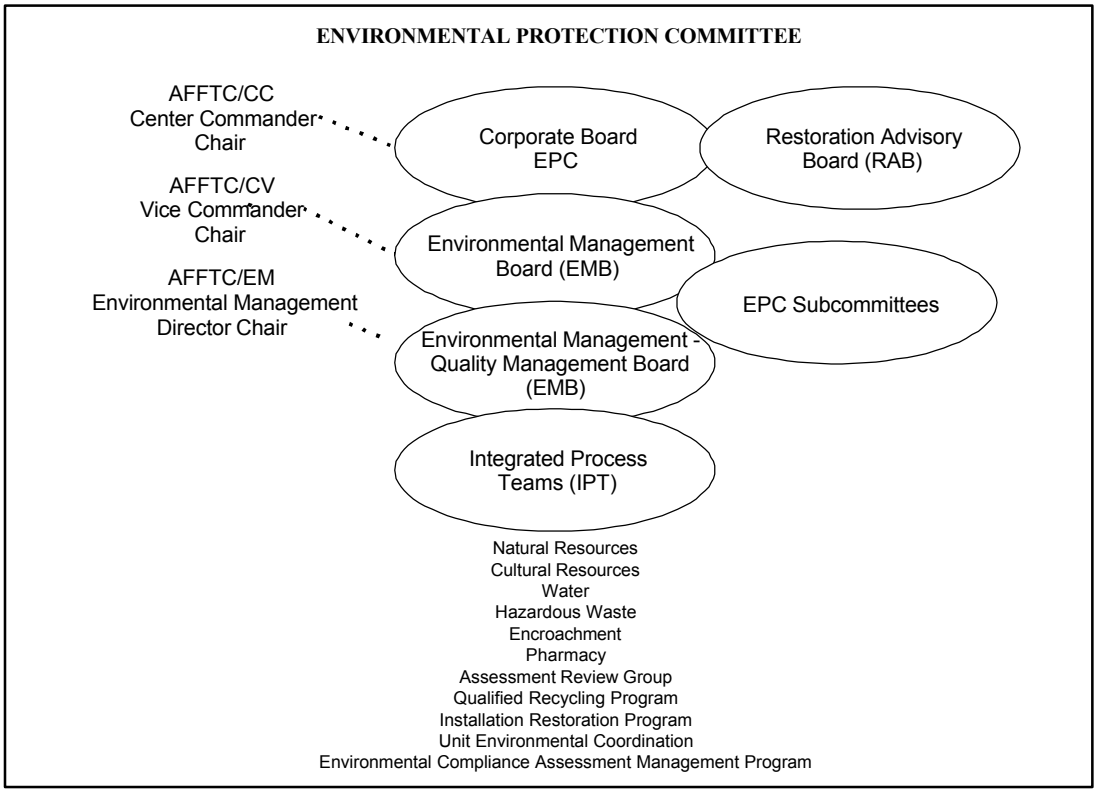


**Figure 2-2. Environmental Protection Committee Organization**

potentially affected disciplines have input into the decision-making process. After review by the Environmental Management Director and the staff, constituting the Environmental Quality Management Board (QMB), recommendations and comments are passed up through the Environmental Management Board (EMB), chaired by the installation Vice-Commander; and finally to the Corporate Board EPC, chaired by the installation Commander. This process enables mission requirements and time-critical deadlines to be met while maintaining compliance with applicable environmental regulations and helping to minimize impacts on the natural resources on the Base.

### 2.2.1 Environmental Impact Analysis Process

The Conservation Branch is also responsible for implementing the EIAP at Edwards AFB in accordance with the National Environmental Policy Act (NEPA) (42 USC 4321, et seq.), the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) implementing the NEPA, and AFI 32-7061. The EIAP ensures that potential environmental concerns are considered as early as possible in the AF planning process. It also serves to integrate all environmental concerns, including natural resource issues, into the decision-making process. The EIAP procedures have statutory public involvement requirements that are determined by the nature of the action and are based on the amount of potential impact. All new projects that have the potential to affect natural resources must be supported by a work request during the project-planning phase.

Only AF approved projects are allowed on Base and they must be covered by one of the following documents: AF Form 103 (Civil Engineering [CE] Work Clearance Request), AF Form 332 (CE Work Request), or AF Form 813 (Request for EIAP). The size of the project and the amount of disturbance determine the required level of documentation. Projects may not proceed without reviewed and signed documentation. Project planning emphasizes maximum reuse of facilities and siting within previously disturbed areas to minimize loss of natural resources. Projects found to have no significant impacts, or impacts covered under a categorical Environmental Assessment (EA), may routinely proceed as exempt or as a categorical exclusion (CATEX) without further processing. The review frequently generates project restrictions that ensure no significant impacts to natural resources. These restrictions must be followed before the project may proceed. An environmental checklist is provided to the proponents with the project restrictions. Projects that are found to potentially have a significant impact are handled through the NEPA process and would require a detailed environmental study. Consultation with the USFWS and substantially more analysis and documentation, as well as public involvement, are required for these projects before they may be approved (Figure 2-3).

In addition copies of the approved INRMP will be made available to all Base organizations, to include associate organizations and contractors, to help ensure that the policies and management strategies/processes are understood and incorporated into all project planning. The approved INRMP will be available on the Air Force Flight Test Center (AFFTC) CenterNet web site.

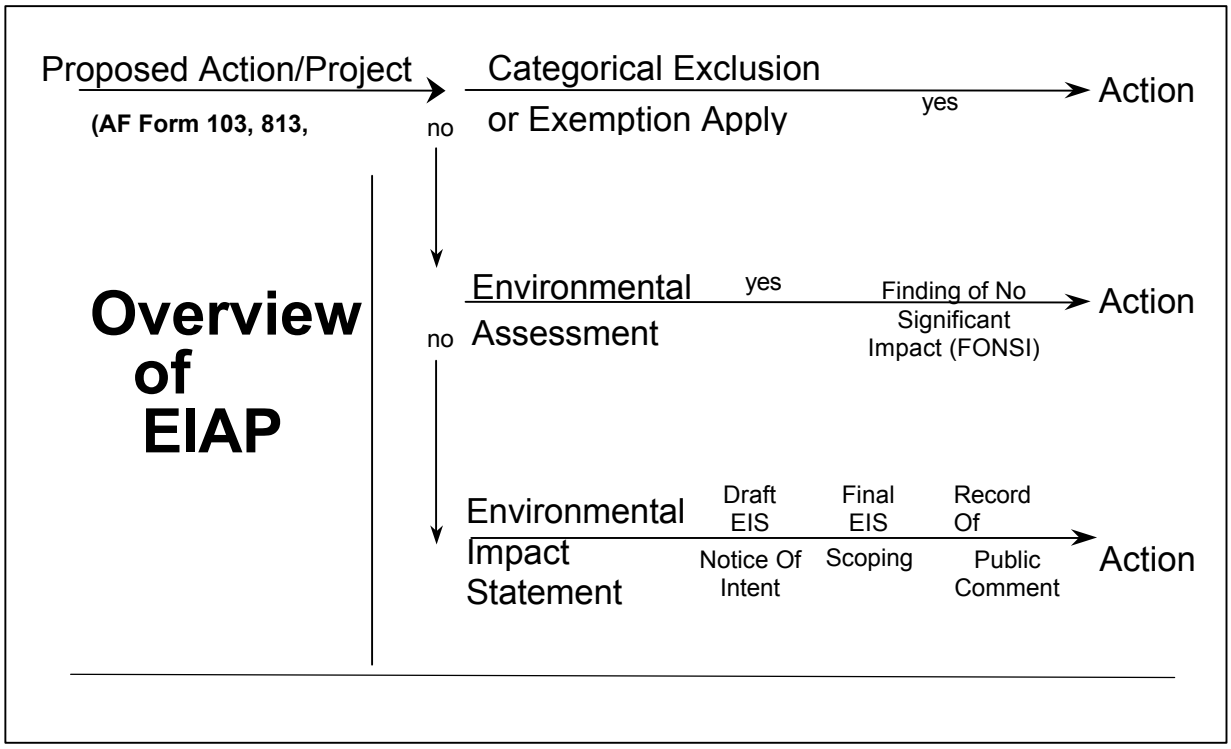


**Figure 2-3. Project Screening and EIAP Review Flow Chart**

### 2.2.2 Geographic Information System

The Edwards Geographic Information System (GIS) uses state of the art equipment, software and configuration control to support the Edwards AFB mission through efficient and effective management of spatial data and the ability to analyze the data in support of specific program and project requirements.

Air Force Flight Test Center Instruction (AFFTCI) 33-17 provides the policy and guidance for GIS management on Edwards AFB. The Center GIS Working Group (GISWG) oversees strategic initiatives related to exploiting GIS as a tool for planning and execution throughout the Base. The Environmental Management Directorate is a key member of the GISWG and uses GIS extensively in all aspects of environmental programs. In support of all environmental programs, including the Natural Resources Program, GIS provides:

a. encoding capability – collection and entering of data,

b. storing capability – organizing and managing data,

c. data processing capability – spatial analysis and modeling, and

d. displaying capability – maps and data tables.

The Edwards GIS is used by the Environmental Management Directorate to assist in analyzing environmental impacts from proposed projects, managing habitat restoration efforts, supporting species population monitoring, and developing management plans (including this INRMP). This

organized collection of computer hardware, software, geographic data and personnel enables users to create and manipulate intelligent maps to analyze information in order to determine environmental impacts resulting from proposed projects, analyze habitat disturbance, and conduct population monitoring. Geographic Information System has been and continues to be instrumental in the formulation of threatened and endangered species management strategies Basewide.

### 2.2.3 Programming Natural Resource Management Activities

The projected requirements and cost estimates for implementing the INRMP are shown in Table 2-1. Implementation of these natural resource management activities is subject to headquarters validation and funding availability.

**Plan Review and Update.** The INRMP is reviewed annually to ensure consistency with the applicable laws or regulations and mission requirements. The Environmental Management

**Table 2-1. Estimated Budget (based on available yearly funding)**

| Natural Resources Management Activities: Program Requirements and Cost Estimates | | | | | |
|---|---|---|---|---|---|
| **Project** | **FY 02** | **FY 03** | **FY 04** | **FY 05** | **FY 06** |
| **Fish and Wildlife Management** | | | | | |
| Planning-Level Vegetative Surveys | $250,000 | $200,000 | $200,000 | $200,000 | 0 |
| Animal Inventories and Surveys | $150,000 | $260,000 | $150,000 | $160,000 | $235,000 |
| Upgrade Herbarium Collection/Tech Support Capabilities | $15,000 | $26,000 | $15,000 | $26,000 | $15,000 |
| Habitat Conservation/Restoration Projects | $125,000 | $325,000 | $425,000 | 0 | $150,000 |
| Pest Management Program (nondeveloped areas, required surveys and plan development) | $75,000 | $75,000 | $75,000 | $50,000 | $50,000 |
| **Threatened and Endangered Species Management** | | | | | |
| Endangered Species Conservation | $75,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| Update/Review INRMP | 0 | 0 | 0 | $2,000 | $70,000 |
| Endangered Species Population Monitoring | $155,000 | $155,000 | $155,000 | $155,000 | $155,000 |
| Endangered Species Project Support | $530,000 | $524,000 | $530,000 | $524,000 | $530,000 |
| **Miscellaneous** | | | | | |
| Floodplains/Flood Prone Studies | $310,000 | 0 | 0 | 0 | 0 |
| Computers/GIS Support of NR | $110,250 | $110,250 | $115,700 | $115,700 | $115,700 |
| Pest Management Program | $75,000 | $75,000 | $75,000 | $50,000 | $50,000 |
| Natural Resources Management | $670,000 | $670,000 | $670,000 | $670,000 | $670,000 |

Notes: 1. FY – Fiscal Year
2. INRMP – Integrated Natural Resources Management Plan
3. GIS – Geographic Information System
4. NR – Natural Resources

Directorate shall implement required changes as necessary. The INRMP is updated at a minimum of every 5 years.

## 2.3 INRMP AND NEPA INTEGRATION

An EA is believed to be the appropriate level of NEPA analysis and documentation for the development and implementation of the INRMP. Several actions have been taken to integrate the INRMP with the NEPA analysis and documentation process. The purpose of the NEPA analysis is to identify and evaluate environmental consequences of the plan.

The NEPA process was integrated early into the planning and development of this INRMP. The NEPA scoping process, through a Notice Of Intent, was used to collect natural resources management information from the general public and State and Federal agencies for the INRMP. This was accomplished to ensure public involvement in the early development of the INRMP as required by the Sikes Act. Letters were written and ads were placed in local newspapers requesting input regarding the INRMP and management of natural resources at Edwards AFB. To streamline this process, the INRMP and its associated NEPA requirements have been integrated into a single process. This satisfies the requirements of Air Force regulations and supports the intent and spirit of NEPA. A discussion of the different approaches to natural resource management can be found in the EA with the INRMP representing the preferred alternative.

# 3.0 LAND USE, MISSION ACTIVITIES AND THEIR POTENTIAL EFFECTS ON THE ENVIRONMENT

## 3.1 LOCATION AND AREA

Edwards AFB is located on approximately 301,000 acres in the Antelope Valley in Southern California (Figure 3-1). The installation lies in the western Mojave Desert in portions of Kern, Los Angeles, and San Bernardino counties. The Base is approximately 100 miles northeast of Los Angeles, 90 miles northwest of San Bernardino, and 80 miles southeast of Bakersfield. Approximately 11,000 military and civilian personnel work on Edwards AFB. Many of who live either on the Base or in the nearby communities of Lancaster, Palmdale, and Rosamond.

## 3.2 CURRENT MILITARY MISSION

The mission of the AFFTC is to conduct and support research, development, test and evaluation of manned and unmanned aerospace systems.

The AFFTC supports the mission of the Air Force Materiel Command (AFMC) by conducting and supporting tests of aerospace vehicles, flight evaluation and recovery of research vehicles, participating in developmental test and evaluation programs for the DoD and other government agencies, and operation of the U.S. Air Force Test Pilot School; and developing, operating,

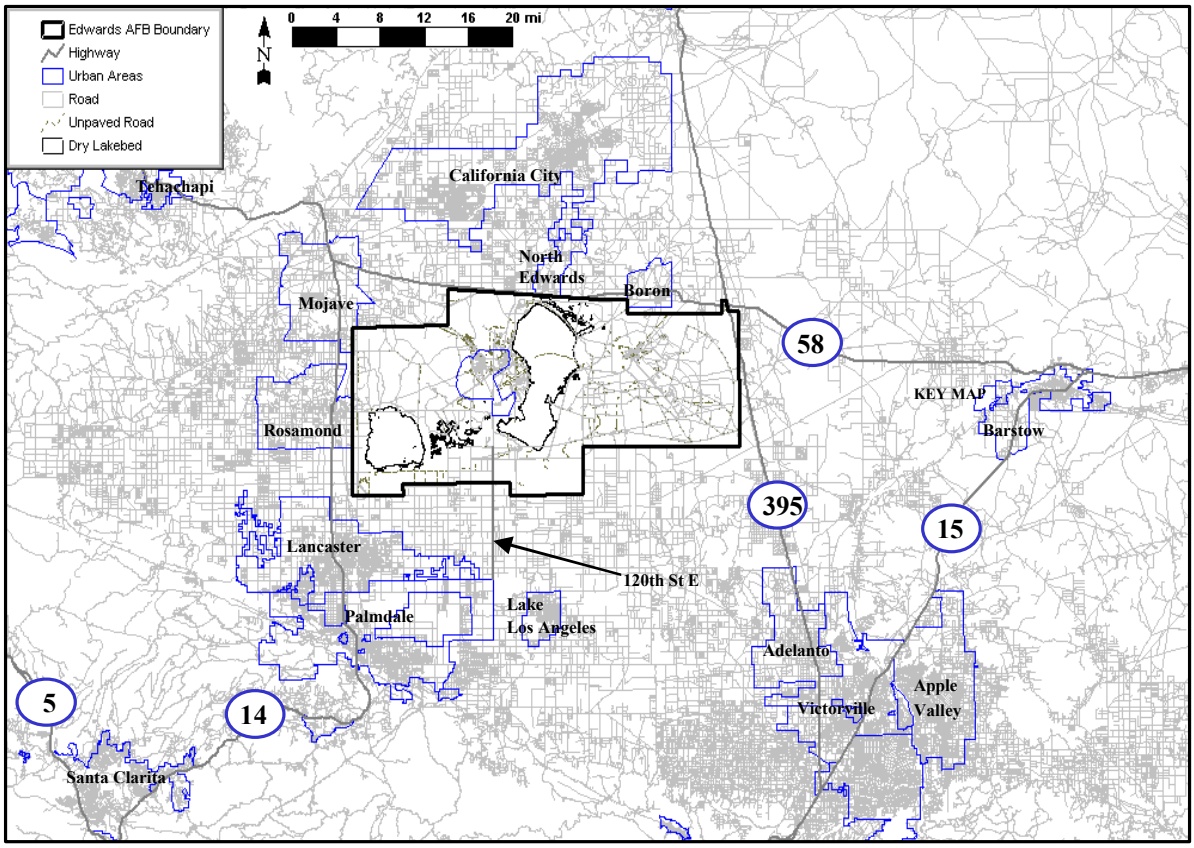


**Figure 3-1. Location and Area of Edwards AFB**

staffing, and supporting other developmental test and evaluation programs for contractors and foreign governments. With good flying weather year-round and 65 square miles of usable aircraft landing area on the Rogers and Rosamond Dry Lakes, the Base provides an excellent site for aircraft test and emergency landing activities. Much of the flight test operations are conducted within the R-2508 restricted airspace, a 20,000-square-mile area jointly managed by Edwards AFB, China Lake Naval Weapons Center, and Ft. Irwin. Edwards AFB coordinates operations in R-2508 with the applicable land management agencies.

The AFFTC advances and uses technology to acquire and sustain systems in partnership with its customers through integrated management of research, development, test, acquisition, and support activities. The AFFTC performs continuous product and process improvement through the life cycle of various systems. As an integral part of the Air Force team, the AFFTC contributes to combat superiority, readiness, and sustainability.

The AFFTC hosts many associate organizations. One of the most well known AFFTC associates is the National Aeronautics and Space Administration (NASA) Dryden Flight Research Center (DFRC). The NASA DFRC provides staff and facilities for research and testing aircraft and remotely piloted research vehicles. Edwards AFB is also an alternative-landing site for the Space Shuttle. Another major associate on the Base is the Air Force Research Laboratory (AFRL), which conducts research in rocket component development and testing, as well as advanced propellant research.

## 3.3 AFFTC ORGANIZATIONS AND THEIR ACTIVITIES

The host organization at Edwards AFB is the Air Force Flight Test Center. It has two Wings: the 412th Test Wing and the 95th Air Base Wing (Figure 3-2).

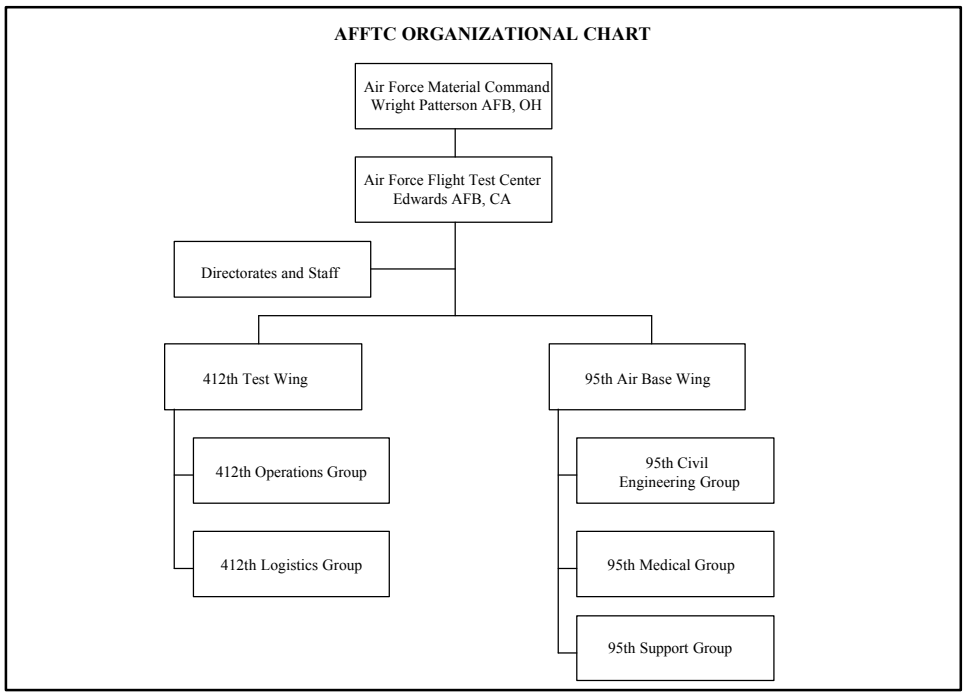


**Figure 3-2. Edwards AFB Organizations**

**Air Force Flight Test Center (AFFTC).** The AFFTC is charged with supporting the AFMC mission by conducting and supporting research and development, as well as, developmental test and evaluation of both manned and unmanned aerospace vehicles. This mission involves all aspects of testing of aerospace vehicles, and includes the flight evaluation and recovery of research vehicles, development developmental testing of aerodynamic decelerators, and the operation of the United States Air Force Test Pilot School. To support this testing, the AFFTC operates and manages the Edwards Flight Test Range. The Center operates a fleet of testbed aircraft for early developmental testing of new avionics, and Advanced Range Instrumentation Aircraft (ARIA) worldwide in support of a variety of space and missile tests. The Center supports and participates in test and evaluation programs for the Air Force, other DoD activities, and other government agencies such as NASA DFRC, as well as for contractors and foreign governments.

**412th Test Wing.** The 412th Test Wing is the direct mission organization at the AFFTC. It is assigned the responsibility of the developmental test and evaluation of manned and unmanned aerospace vehicles, subsystems, and components. The test wing is responsible for all aspects of the developmental test, and evaluation effort on manned and unmanned air vehicles, which includes the overall management of the test effort (e.g., planning, conducting, and reporting).

The U.S. Air Force Test Pilot School (TPS) is a division of the 412th Test Wing. The TPS trains experienced pilots, engineers, and navigators to organize, supervise, and conduct flight tests to obtain research and developmental test and evaluation data on experimental and prototype aircraft and systems.

**95th Air Base Wing.** The 95th Air Base Wing (95 ABW) is the support unit for Edwards AFB. From the time personnel arrive at the Base until they leave, they receive continuous support from the members of this unit. The wing provides essential business services, emergency response, infrastructure/facilities, information service, logistical support, and personnel services to support the core purpose of the AFFTC and the more than 30 associate units assigned to Edwards AFB and the surrounding area.

Additionally, the Base supports a number of associate units that operate on Base and in other locations in Southern California and across the United States. The associate units that operate on Edwards AFB are briefly described in the following section.

**National Aeronautics and Space Administration Dryden Flight Research Center (NASA DFRC).** The NASA DFRC mission is to plan, conduct, analyze, and report on all aeronautical disciplines associated with a wide variety of aircraft and aerospace vehicle flight research projects. The NASA DFRC is the nation's preeminent aeronautical research facility, developing new technologies that will lead to improved aircraft flight control components and systems. The NASA DFRC also helps transfer new concepts to the United States aerospace industry for commercial and military applications. Activities in support of this mission have historically included flight research of advanced control concepts. This includes aerospace vehicle handling qualities and flight loads; research on piloting problems, biomedical aspects of low- and high-performance aircraft; investigations into the problems of takeoff, landing, aircraft noise, low-speed flight, supersonic and hypersonic flight, and aerospace vehicle re-entry characteristics. The

NASA DFRC also works to identify and explore unpredicted phenomena encountered in flight, and develops flight testing and in-flight simulation techniques.

**Air Force Research Laboratory (AFRL):** The mission of the AFRL is to plan, formulate, present and execute the Air Force's Science and Technology programs. At the Edwards research site, the emphasis is on rocket propulsion concepts, propellants, components, and systems for both missile and space applications. The Edwards research site also hosts sea level static and altitude test cells for full-scale rocket engine and motor testing. The AFRL also acts as the AFMC focal point for information in the assigned technical areas. An integral part of the AFRL mission entails executing assigned projects for, and working closely with, the Army, Navy, NASA, and other government agencies; supporting AFMC programs, ensuring the rapid application of research and technology to advanced systems; and assisting in the evaluation of foreign aerospace technology.

**18th Space Surveillance Squadron (18 SPSS):** The mission of the 18 SPSS is to provide direct support to the United States Commander in Chief/Space's Space Control Mission through optical space surveillance. This includes detection, tracking, identification, and special signature collection of near-space and deep-space objects. To accomplish the mission, 18 SPSS operates a network of optical sensors in three worldwide locations.

**USMC Marine Aircraft Group 46**: This includes the Marine Medium Helicopter Squadron 764 (Moonlighters) and Marine Heavy Helicopter Squadron 769 (Roadhogs). The mission of Marine Aircraft Group 46 is to organize, train, and equip combat proficient squadrons of Marines to mobilize, augment, and reinforce the active components serving as part of the Marine Corps' total force.

## 3.4 INSTALLATION HISTORY

A brief consideration of the history of man-induced activities and location of populations in the Mojave Desert in recent centuries is relevant to natural resource use on Edwards AFB. Prehistorically, several Numic groups lived and moved throughout the current location of Edwards AFB. They were followed in the early part of the 18th century by several Spanish military expeditions. While the Spanish expeditions traversed the Edwards AFB area, no native settlements were recorded in the area of the Base during the later part of the 18th century.

At the turn of the 19th century, the area from present day Lancaster to Buckhorn Springs attracted many interested parties in search of mining opportunities and new trails to an unexplored frontier. By the middle of the century, the area of the current Base boundaries was used for crops, grazing, and transportation corridors for wagon trains heading northward across the valley. As the later part of the century arrived, so did many settlers raising livestock. These settlers dug many wells for their use just east of Rosamond and Rogers Dry Lakes.

By 1911, many homesteads had been established in the general area of Base boundaries. Settlers raised livestock and searched the area for minerals. Traffic between what is now known as the town of Rosamond and the area of Boron became a common sight. Mining in the area intensified

as settlers staked out areas suspected of being rich in gold, borates, and copper. The successful mining for borates brought many settlers and increased the travel across the dry lake areas and resulted in many additional homesteads. Large trenches were also dug in the dry lakebeds for clay, which was used in the oil industry.

The military established Muroc Bombing and Gunnery Range on the east side of Rogers Dry Lake in 1931. Muroc Army Air Field grew dramatically during World War II. Prior to the war, in mid-1941, the permanent population of Muroc Bombing and Gunnery Range was 150 enlisted men. By the end of 1942, 6,300 men were permanently stationed at the Base. To support this population, the Army constructed 1,090 temporary hutments and 383 permanent hangars and support buildings on the western shore of Rogers Dry Lake. By the end of World War II, the facility contained hangars, administrative buildings, barracks, officers' quarters, a hospital, a post exchange and commissary, a library, two mess halls, two chapels, two theaters, two noncommissioned officers' clubs, two officers' clubs, and recreational buildings.

In 1947, the Government awarded Aerojet Engineering Corporation the contract to construct an Air Force Experimental High-Thrust Rocket Test Station, and the Army Corps of Engineers began installing infrastructure, such as roads and utilities, for the facility. In 1949, the Air Materiel Command formed a Rocket Branch at the Muroc facility, and the Army Corps of Engineers began constructing nontechnical facilities at Leuhman Ridge in November. Aerojet Engineering Corporation began constructing the technical facilities in February 1950.

Nearly every aircraft entering the Air Force inventory over the past four decades has been tested and developed at Edwards AFB. Other DoD agencies have also historically used Edwards AFB for developmental test and evaluation of fixed- and rotary-wing aircraft. Edwards AFB has also been the site where lifting-body research flights helped NASA develop and design the Space Shuttle. It was the site of the Space Shuttle's approach and landing tests and the first shuttle landing from space.

## 3.5 LAND USE AND TRANSPORTATION

This section provides an overview of existing land uses and transportation networks and the plans for future development of Edwards AFB. Land use areas are based on the predominant function of a given area. During the development of the 2001 *Edwards AFB General Plan*, the Air Force standard land use categories were expanded to facilitate identification and analysis of the various unique land uses on Edwards AFB. Therefore, instead of the standard 12 land use categories, 17 were established. Each category of land use is indicative of the predominate use of the facilities or land within that area and reflects the unique mission requirements and physical features, such as the dry lakebeds, found at Edwards AFB.

Because of the physical size of the installation landmass, the Base was divided into developed and undeveloped areas. The developed area, or cantonment area, consists of the urbanized area along Yeager, Rosamond, and Lancaster Boulevards. This covers an area extending from South Base to the installation's boundary and from the hospital area east to the edge of Rogers Dry Lake. It includes Main Base, South Base, North Base, and National Aeronautics and Space Administration

areas. Table 3-1 reflects the areas of the specific land uses within both the developed and undeveloped portions of the installation.

Access to Edwards AFB land use areas is attained through an existing transportation network. Two primary streets carry the majority of traffic. These are Rosamond and Lancaster Boulevards. Four secondary streets distribute traffic from the primary streets to the residential areas and between the residential areas and the industrial and flightline areas. These are Forbes and Wolfe Avenues, and Yeager and Fitzgerald Boulevards. All other streets are classified as tertiary streets, serving individual areas on the installation. A network of unpaved roads and jeep trails provide access to the remote undeveloped areas of the installation.

Freight service is provided to the installation by the Burlington Northern Santa Fe (BNSF) Railroad from its mainline that parallels the northern boundary. A rail spur connects the BNSF main line to the government-owned trackage servicing the Main Base. A rail spur from Edwards Station connects the government-owned rail servicing the Main Base. The primary government rail spur is routed along Rosamond Boulevard to the supply warehouse area. Additional spurs lead from the warehouse to the unconventional fuel storage area and the Petroleum, Oil, and Lubricants (POL) storage area. South of the city of Boron another primary spur leads to the AFRL.

**Table 3-1.**
**The Existing Land Uses, by Category, for the Developed and Undeveloped Areas of the Installation**

| Land Use Category | Developed Area (acres) | Area Installation (acres) | Percent of Base |
|---|---|---|---|
| Aircraft Clearance and Explosive Clear Zones | 2,697 | 3,110 | 1.04 |
| Aircraft Pavements | 584 | 582 | 0.19 |
| Lakebed Painted Runways | 10 | 1,997 | 0.66 |
| Lake Nonmaintained Landing Site | 0 | 39,040 | 12.98 |
| Aircraft Operations and Maintenance | 131 | 128 | 0.04 |
| Engineering Test | 1,467 | 17,683 | 5.88 |
| Aircraft Test Range | 913 | 215,186 | 71.54 |
| Industrial | 2,451 | 7,795 | 2.59 |
| Administrative | 73 | 122 | 0.04 |
| Community (Commercial) | 129 | 134 | 0.04 |
| Community (Service) | 185 | 192 | 0.06 |
| Medical | 47 | 45 | 0.01 |
| Housing (Accompanied) | 923 | 922 | 0.31 |
| Housing (Unaccompanied) | 55 | 51 | 0.02 |
| Outdoor Recreation | 1,532 | 2,451 | 0.82 |
| Buffer Zones | 7,130 | 11,360 | 3.78 |
| Jurisdictional Waters | 0 | 0 | 0 |
| **Total** | 18,327 | 300,798 | 100.00 |

*Modified from: Edwards AFB Comprehensive Plan, June 1994, as cited in the 2001 General Plan.*

Access to the installation is controlled through three primary gates.

a. West Gate is located on Rosamond Boulevard approximately 9 miles from the western boundary. This gate handles approximately 42 percent of all Base traffic.
b. South Gate is located on Lancaster Boulevard approximately 2 miles from the southern boundary. This gate handles approximately 38 percent of all Base traffic.
c. North Gate is located on Rosamond Boulevard at the northern boundary. This gate handles approximately 20 percent of all Base traffic.

### 3.5.1 Land Use Management Areas

Edwards AFB is a large installation that supports a diversity of resources and mission activities. In delineating Management Areas at Edwards AFB, consideration was given to the types of mission activities, both current and planned/proposed, as well as to the presence and condition of natural habitats and resources. In developing an overall mission execution and natural resources management strategy for the installation, the Base property has been divided into smaller, more manageable units in order to facilitate oversight of activities and management of natural resources. These units are called Land Use Management Areas (Figure 3-3). Management strategies have been identified for each management area that integrate mission and support uses (e.g., flight test) with natural resource conservation. Mission activities and resources to be managed in each management area are described in Appendix A.

### 3.5.2 Future Land Use and Transportation Plans

The future Land Use and Transportation Plans included in the General Plan are viewed as long-range goals and provide starting points for discussions regarding the siting of new facilities or land disposition actions. They provide a framework that attempts to define the optimum layout of land uses and transportation corridors in support of functional effectiveness, efficiency, and compatibility. Land use and transportation constraints and opportunities are covered in their respective paragraphs of the General Plan 2001.

The seven management areas that are currently used at Edwards AFB include:

a. Aircraft Overflight Test Area – Management Area A;
b. Precision Impact Range Area (PIRA) – Management Area B;
c. Developed Areas – Management Area C;
d. Combat Arms Range – Management Area D;
e. Dry Lakebeds, Flight Test/Runways – Management Area E;
f. Military Exercise/Test Area – Management Area F; and
g. Air Force Research Laboratory – Management Area G

### 3.5.3 Management Area Goals

Individual management plans have been developed to ensure that mission activities are planned and conducted in a manner that considers best management practices on the Base. Altogether,

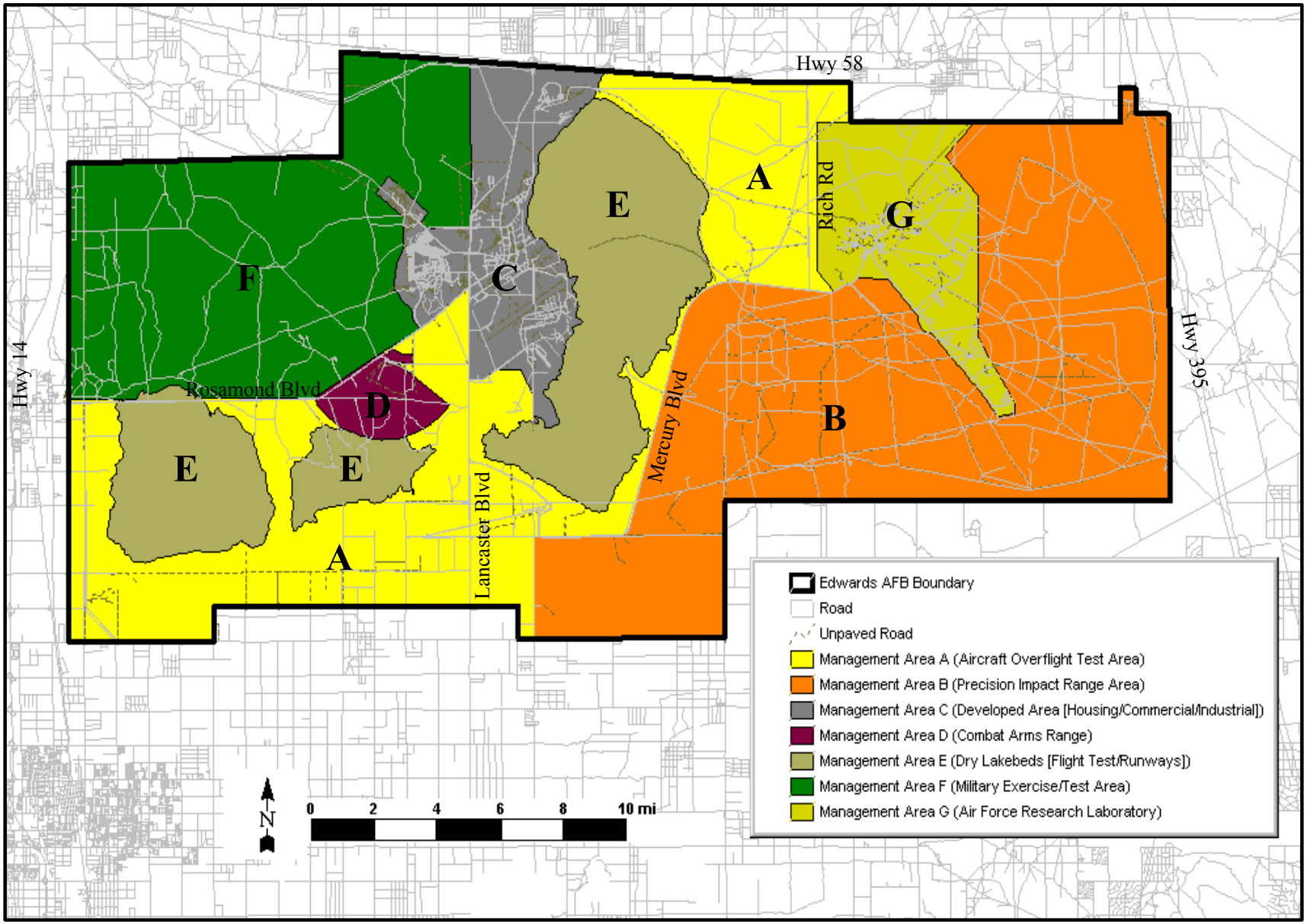


**Figure 3-3. Land Use Management Areas Delineated on Edwards AFB**

these plans and management strategies have been designed to meet the overall goal of mission activities while maintaining and enhancing environmental resources at Edwards AFB.

### 3.5.4 Management Area Descriptions

**Management Area A (Aircraft Overflight Test Area)** is an undeveloped area used as a buffer zone around the Rod and Gun Club, Camp Corum area, and Main Base Runway 04/22. This management area extends to just northeast of Rogers Dry Lake. It is generally undeveloped and supports aircraft test activity, including a jettison area at the end of the runway for emergency offloading. This area does not currently play a major part in mission operations on the ground. Projects in the area are mostly tied to infrastructure improvement and maintenance.

This management area includes natural and man-made water sources in the southwestern and south-central portion of the Base used by wildlife, and includes Piute Ponds and Branch Memorial Park Pond. These areas also serve for various outdoor recreational uses. In addition, this area includes Base well fields and claypan playas. Future uses in this management area are expected to be similar to current uses.

**Management Area B (Precision Impact Range Area)** covers a large portion of the eastern part of the Base. It is used for aircraft flight testing, explosive ordnance disposal, and the placement of communication equipment. This area is used to test aircraft targeting equipment and for practice in precision bombing. Other activities and uses in the PIRA are severely restricted and occur only occasionally, scheduled around the range use. No change in these uses is planned.

The PIRA supports high desert tortoise densities, sensitive nonlisted species, and some of the highest quality wildlife habitat on the Base. A large portion of the PIRA has been designated as desert tortoise critical habitat and requires different levels of protection measures be followed based upon the zone and activities to be conducted.

**Management Area C (Developed Area [Housing/Commercial/Industrial])** comprises Main Base, North Base, South Base, NASA, and the Base landfill. This management area contains the runway and airfield support facilities, as well as research and development, operations and maintenance, engineering, and other industrial use areas. This management area also includes military family housing and the community support area in the western portion of the Main Base. Mission activities include aircraft testing, operation, maintenance, site demolition, site redevelopment, and administrative, medical, educational, and commercial uses. Facility siting is planned to change improved areas to semi-improved areas, and semi-improved areas to unimproved areas wherever possible.

High water use, groundwater contamination, and stormwater flow are water resource issues of concern that are addressed in recommended management programs in this area. Other issues of environmental concern while operating in this area are Bird/Aircraft Strike Hazard (BASH) management, pest management, desert tortoise protection, and vegetation recovery.

**Management Area D (Combat Arms Range**) is located in the west-central portion of the Base. Mission activities for this area include the Combat Arms Range, the Rod and Gun Club, and outdoor recreational areas. This area is relatively small and designated as a specific land use area. It is located apart from other developed areas and facilities for safety and noise considerations. This use will continue unchanged. This area includes desert tortoise and other protected species and should be managed with special care.

**Management Area E (Dry Lakebeds [Flight Test/Runways])** comprises Rogers, Rosamond, and Buckhorn Dry Lakebeds, which are distinctive and critical features of Edwards AFB. From a mission standpoint, they are one of the factors that has influenced the development of the Base into a major center for testing and mission support of aircraft and spacecraft. Because of their uniqueness, they will continue to be used to support aircraft and space mission activities.

Minimizing ground disturbance and development in the dry lakebeds, especially Rogers Dry Lake, is particularly important in order to minimize impacts to the surface of the dry lake, which is critical for aircraft test activities. Use and maintenance of the runways and associated activities are planned and implemented to minimize impacts to the lakebed.

**Management Area F (Military Exercise/Test Area)** is located in the northwest corner of the Base. Mission activities include aircraft testing and a buffer zone on the northwest side of military family housing. Subunits identified in this management area include designated hunting areas and off-road vehicle (ORV) use areas; the remainder of the management area is primarily open space under aircraft test areas. These uses are expected to continue relatively unchanged within the planning period for the next 5 years. Development in this management area is limited and is likely to remain so in order to support continued aircraft testing. Future planned projects in the area may include airfield (emergency runway) improvement and radar reflector repair.

This area is relatively undeveloped and includes desert tortoise and Mohave ground squirrel populations, and is a good nesting and roosting area for bird and bat species.

**Management Area G (Air Force Research Laboratory)** is a relatively isolated developed area in the northeastern portion of the Base surrounded by undeveloped aircraft test and targeting areas. Mission activities conducted at the laboratory include testing rocket engines, extensive safety zones surrounding the test cells, and industrial, research, development, and administrative uses. Other activities in this management area include Installation Restoration Program (IRP) areas, infrastructure maintenance and improvement (including a wastewater facility), and test-related activities for routine fuels.

This area includes Haystack Butte and Leuhman Ridge, which supports special wildlife species including the Federally-protected Peregrine Falcon. This area also supports sensitive plant species including Barstow woolly sunflower and Desert cymopterus.

## 3.6 OFF-INSTALLATION LAND USE

The land adjacent to the installation is predominantly sparsely populated arid desert. The communities actually abutting the installation boundary are Boron, Kramer Junction, Mojave, and Rosamond. North Edwards, Lancaster, and other communities, although close in proximity, pose limited encroachment issues that would interfere with the accomplishment of the AFFTC mission.

Local and regional natural areas containing sensitive natural resources under the management of State and Federal agencies are present within 50 miles of Edwards AFB and share common migratory and less mobile wildlife (Figure 3-4).

**Bureau of Land Management.** The Bureau of Land Management (BLM) is responsible for designing studies, researching, monitoring, and protecting desert tortoise populations on several million acres of public land in the Mojave Desert. In 1973, the BLM designated a 38-square-mile preserve to protect desert tortoises. The Desert Tortoise Natural Area is 15 miles north of Edwards AFB.

**Forest Service.** Angeles National Forest, approximately 20 miles southwest of Edwards AFB, and Sequoia National Forest, approximately 30 miles to the northwest, are managed by the U.S. Forest Service (Forest Service).

**State Parks.** Saddleback Butte is a 3,000-acre California State Park 5 miles south of Edwards AFB. Along with the nearby 300-acre Antelope Valley Indian Museum, Saddleback Butte is a natural area that provides habitat for many of the same sensitive species that occur on Edwards AFB. The desert tortoise, the prairie falcon, the Mohave ground squirrel, and a variety of sensitive plants have been noted and are managed by the California Department of State Parks.

### 3.6.1 Regional Transportation Network

One U.S. highway and two state highways connect Edwards AFB to the local communities and the interstate highway system.

a. U.S. Highway 395 parallels the eastern boundary and leads to I-15, 40 miles to the south near Victorville. Northward 380 miles, it leads to Reno, NV and I-80.

b. California State Highway (SH) 58 parallels the northern boundary and leads 50 miles eastward to Barstow and I-15. Westward it leads 77 miles through Mojave, Tehachapi, and Bakersfield to I-5.

c. California State Highway 14 parallels the western boundary intersecting SH 58 at Mojave at the northwestern corner of the installation. From there, it leads south through Lancaster and Palmdale to I-5, 53 miles to the south.

The BNSF Railroad mainline parallels the northern boundary. A Union Pacific line runs parallel to the installation's western boundary and adjacent to Sierra Highway in Rosamond. However, this north-south mainline does not provide service to Edwards AFB.

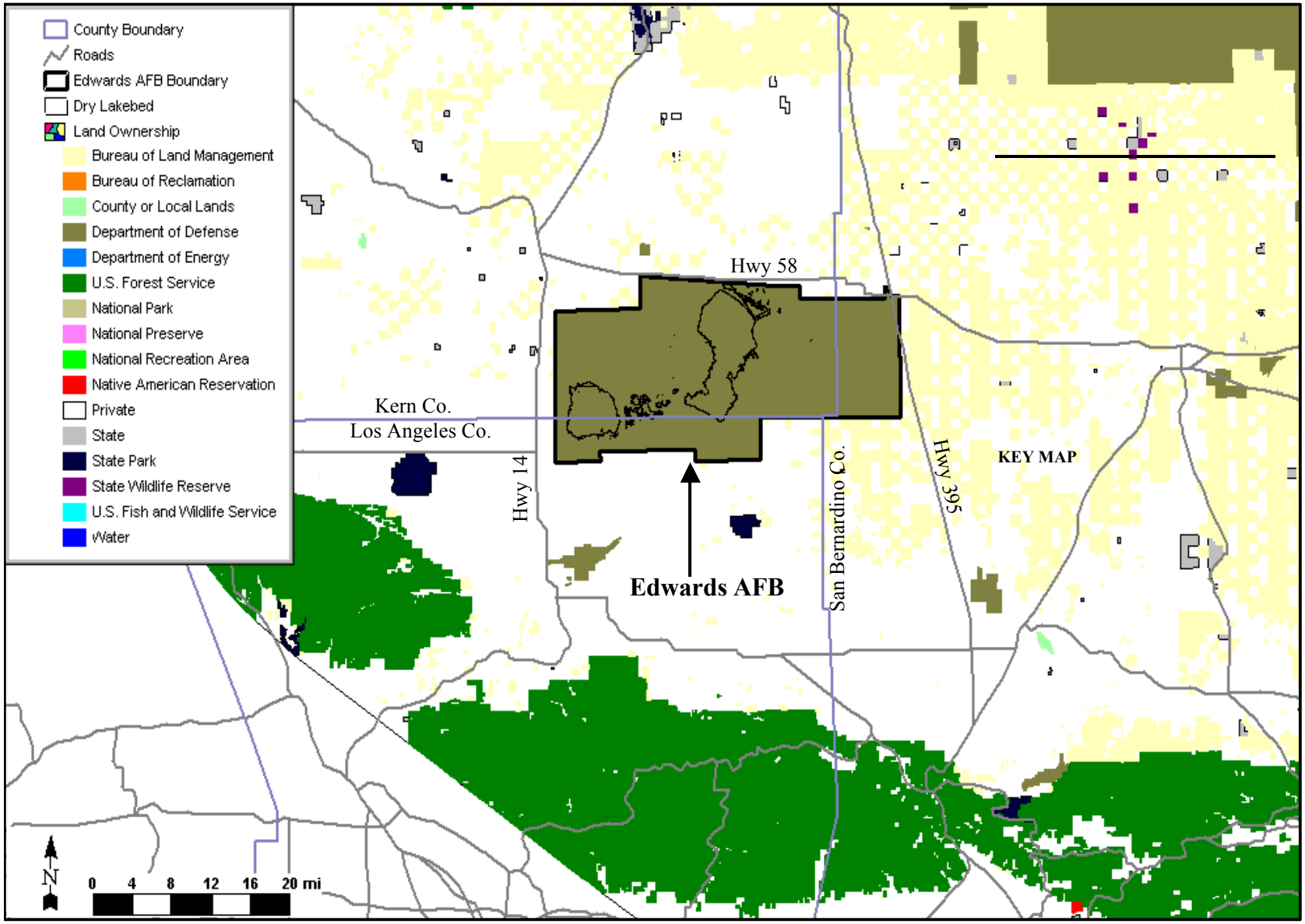


**Figure 3-4. Land Ownership in the Mojave Desert**

### 3.6.2 Off-Base Development Plans

Non-Air Force off-Base development is coordinated through the Encroachment Prevention and Management Committee of the EPC.

## 3.7 MISSION ACTIVITIES THAT MAY AFFECT NATURAL RESOURCES

Test activities at Edwards AFB include aircraft test flights that take off from and land at the main runway or the dry lakebeds, inert bombing tests in the PIRA in the eastern portion of the Base, and static testing of rocket motor/engines at the AFRL. Much of the aircraft testing takes place at altitude-in-spin test areas and low-level and supersonic test corridors; these test activities have very little ground activity and little impact on natural resources. Large areas of the Base remain relatively undisturbed and undeveloped in order to accommodate these testing activities, allowing conservation of natural resources. Ground-disturbing impacts on natural resources are created by inert bomb impacts, engine testing, runway-related activities, and construction. In addition, support and nonmission related activities, such as management and disposal of hazardous substances, industrial operations, maintenance activities, and recreational activities, including off-road vehicles, may also potentially affect natural resources.

### 3.7.1 Installation Restoration Program

Management of the IRP at Edwards AFB is the responsibility of the Environmental Management Directorate. The DoD established the IRP in 1975 to provide guidance and funding for the investigation and remediation of hazardous waste sites caused by historical disposal activities at military installations. The fundamental goal of the restoration program is to protect human health, and the environment. The primary Federal laws driving the IRP activities are CERCLA, the Comprehensive Environmental Response, Compensation and Liability Act (42 USC 9601 et seq.) and SARA, the Superfund Amendments and Reauthorization Act. The CERCLA was passed in 1980 and required the cleanup, or remediation, of hazardous waste sites created by historical disposal practices. Congress gave the EPA responsibility for overseeing compliance with this law. Additionally, Congress created the Defense Environmental Restoration Program (DERP) (10 USC 2701) with specific responsibility and authority to the DoD to cleanup contamination located on DoD lands. The DERP closely follows and implements the cleanup processes detailed in CERCLA. The responsibility for cleanup of DoD installations and lands was given to the defense department. The U.S. EPA and the various states participate in that cleanup effort by identifying the applicable or relevant and appropriate cleanup standards and procedures.

Edwards AFB falls under CERCLA because parts of the Base have been listed on the National Priorities List (NPL). This is the EPA's list of hazardous waste sites that are priorities for remediation. The Resource Conservation and Recovery Act (RCRA) and NEPA also help guide IRP activities. The IRP at Edwards AFB is managed by the Environmental Management Directorate and is responsible for the investigation and, if necessary, remediation, of former disposal and test areas.

Edwards AFB was listed on the NPL on 30 August 1990. Edwards AFB, the U.S. EPA, the Department of Toxic Substances Control (DTSC) of the California EPA (Cal/EPA), and the

California Regional Water Quality Control Board (CRWQCB), Lahontan Region, entered into a Federal Facility Agreement (FFA) on 24 September 1990. The FFA specifies the time schedule and manner in which Edwards AFB will remediate on-Base contaminated sites.

The IRP areas have been consolidated into 10 operable units (OUs), based on location and/or type of facility or contamination. The OUs are depicted on Figure 3-5. In July of 2004, Edwards AFB will submit a draft Record of Decision (ROD) to the U.S. EPA, the Cal/EPA Department of Toxic Substances Control, and the Cal/EPA Regional Water Quality Control Board for review and approval. The ROD will present a discussion of the cleanup alternatives selected in the 10 Proposed Plans. After the ROD is signed, the Base will complete the design and construction of all the specific cleanup alternatives recommended.

The USFWS has reviewed the Edwards IRP and has issued a Biological Opinion (BO). The BO concludes that implementation of cleanup alternatives will not jeopardize the desert tortoise population, but it requires that the implementation activities adhere to a strict series of conditions to mitigate potential impacts to desert tortoise populations on Base (USFWS 1993). In part, the BO requires preparation of revegetation plans for sites affected by remediation activities. Remediation activities may affect desert tortoise habitat by eliminating burrows, resting places, and mature soil surfaces that would otherwise contain a source of native seeds, forage vegetation, and drinking depressions. A guidance document for revegetation activities has been prepared (AFFTC 1994c) that includes summaries of suitable revegetation techniques.

The Commander recognizes that adverse impacts to natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants and contaminants into the environment or from CERCLA response actions to clean up those releases. The IRP process is responsible for identifying such CERCLA releases, considering risks and assessing impacts to the environment (including impacts to endangered species, migratory birds, and biotic communities), as well as developing and selecting response actions when it is likely that a release could result in an unacceptable risk to ecological receptors. When appropriate, the Environmental Management Directorate staff, in coordination with the USFWS and California Department of Fish and Game, will identify potential impacts to natural resources caused by the release of contaminants and communicate those impacts via the chain of command to the IRP and U.S. EPA. Installation staff will also participate, as appropriate, in the IRP decision making process to communicate natural resource issues, review and comment on documents (e.g. Remedial Investigation and Ecological Risk Assessment), and ensure that response actions, to the maximum extent practicable, are undertaken in a manner consistent with goals and objectives set forth in the INRMP

### 3.7.2 Solid Waste Management

Solid waste management on Edwards AFB is conducted by 95 ABW Civil Engineering. Several solid waste disposal facilities have been located at Edwards AFB, including a number of sites in

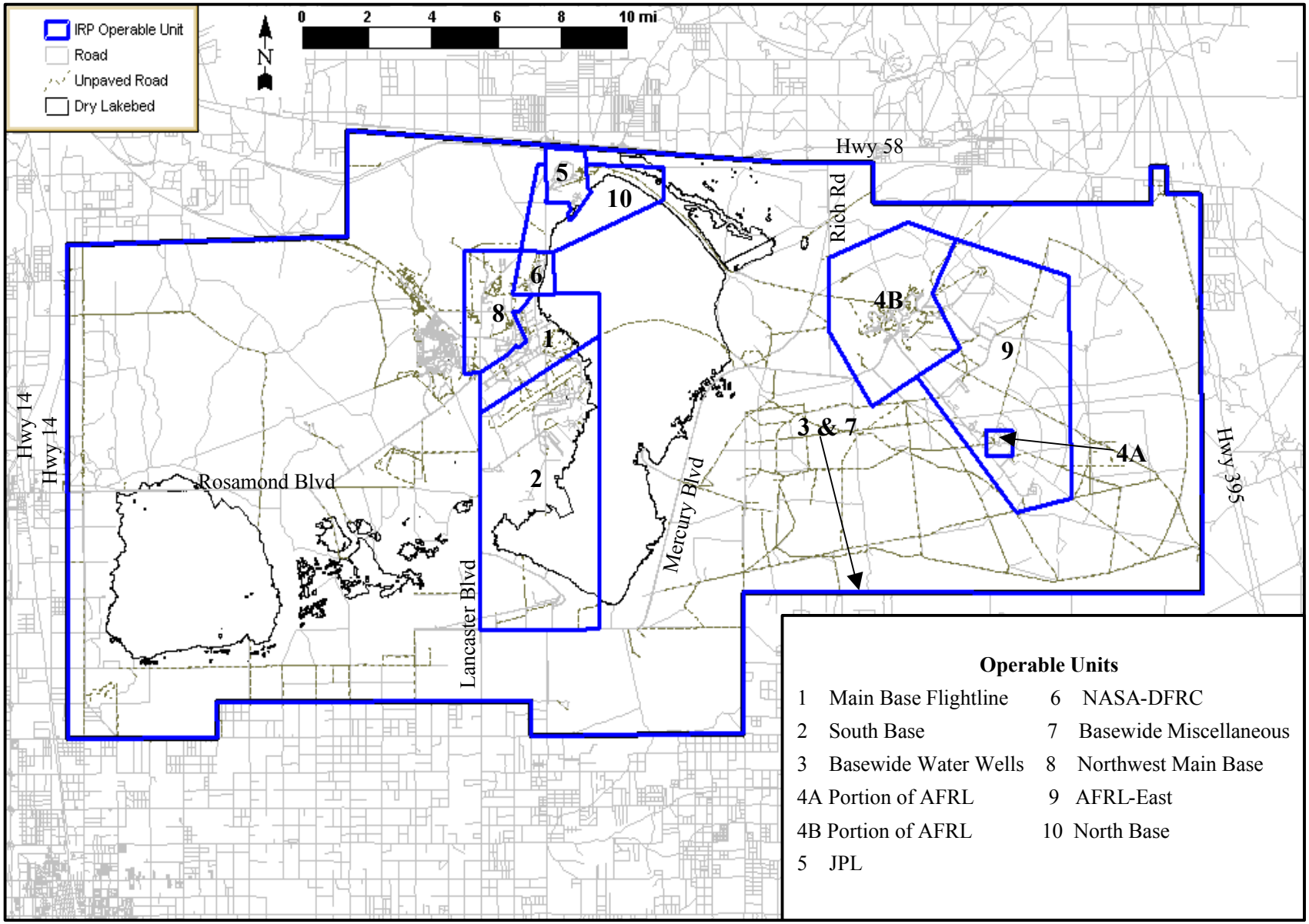


**Figure 3-5. Location of the 10 IRP Operable Units**

use before the Base was established. These include the Main Base Landfill (MBL), Old Main Base, South Base, and the AFRL Landfills. Of these, only the MBL, operated by 95 ABW Civil Engineering, remains active.

The MBL is approximately 1.3 miles north of the family housing area and northeast of Mojave Boulevard. It is currently accepting approximately 635 tons of solid waste per week, of which approximately 40 percent is diverted through the recycling of metals and plastics, composting, and rock crushing. The MBL is a permitted Class III landfill accepting nonliquid, nonhazardous wastes consisting of residential, construction/demolition, commercial, and industrial wastes. The majority of solid waste is compacted, baled, staged under tarpaulins, and then buried. Edwards AFB, through proper planning and operation, is conserving the life of the landfill and using less cover soil.

### 3.7.3 Cultural Resources Management

Cultural Resources Management is the responsibility of the Environmental Management Directorate. Management activities include identification, evaluation, and management of all cultural resources and collected materials. The cultural resources management program includes the survey, inventory, and evaluation of cultural resources. The management program also includes mitigation; curation; and the protection and stabilization of sites, and Native American consultation; education; and monitoring activities.

Much of Edwards AFB has already been surveyed for cultural resources. As of June 2001, over 3,000 sites have been identified on Edwards AFB. Site types identified to date include prehistoric sites (villages, temporary camps, rock shelters, milling stations, lithic scatters, quarries, cremations, rock features, and rock art), historic archaeological sites, and historical structures. One site, the northern portion of Rogers Dry Lake, is a National Historical Landmark. Although Edward AFB has met its primary cultural resource survey requirement, much of the Base remains unsurveyed. The Cultural Resources Overview and Management Plan presents strategies for prioritizing areas to be surveyed and evaluated, based on potential for disturbance and/or potential for dense or large deposits. Edwards AFB is also in the development phase of an Integrated Cultural Resources Management Plan that is tentatively scheduled for completion during the winter of 2001.

# 4.0 NATURAL ENVIRONMENT

## 4.1 CLIMATE

Edwards AFB has a typical continental desert climate in that the region is semiarid to arid with low humidity and a high evaporation rate. The Western Mojave Desert is sheltered from maritime weather influences by the coastal range to the west and by the San Gabriel Mountains to the south. Winter temperatures can be as low as 3 degrees Fahrenheit (°F), with January and February being the coldest months. Summer maximum temperatures can exceed 110°F, with July being the hottest month. The average annual rainfall for Edwards AFB and the Antelope Valley is 5 inches; however, in the surrounding mountains at elevations of 3,000 feet and higher, there may be as much as 20 inches of rainfall. Ninety percent of the annual precipitation occurs from November through April. The prevailing wind direction throughout the year is west-southwest to southwest. The average annual wind speed is 8 miles per hour. High windspeeds are common throughout the year. Atmospheric stability is high, creating conditions that do not support pollution dispersal.

## 4.2 TOPOGRAPHY

The topography of Edwards AFB is marked by broad expanses of flat-to-gently-sloping plains interspersed with broad domes and, in a few places, more resistant hills that rise sharply above the surrounding plains (Figure 4-1). The domes and hills consist mostly of outcrops of granite and quartz monzonite, with volcanic rock forming some of the smaller features. Elevations on Base range from 2,267 feet above mean sea level (MSL) at Rogers Dry Lake to 3,424 feet above MSL at Red Buttes near the eastern boundary.

The Base can be characterized as having three distinct physiographic areas. The first is an upland area in the northwest portion of the Base north of Rosamond and west of Rogers Dry Lake. This area is characterized by low, rounded hills, including the Rosamond and Bissell Hills, with elevations ranging between 2,270 and 3,200 feet above MSL.

The second physiographic area occupies the central and southwestern parts of the Base. These lowland areas include Rosamond, Buckhorn, and Rogers Dry Lakes and the intervening area. It extends from the southern to the northern boundary of the Base and has a relief of approximately 400 feet, with elevations ranging from 2,270 to 2,675 feet MSL.

The third physiographic area is east of Rogers Dry Lake and extends to the eastern boundary of Edwards AFB. This upland area is similar to that in the northwestern corner of the Base except for two prominent relief features: Leuhman Ridge and Haystack Butte, both over 3,400 feet above MSL. Elevations in this area range from approximately 2,400 to over 3,400 feet above MSL and are the highest of the three physiographic areas on the Base.

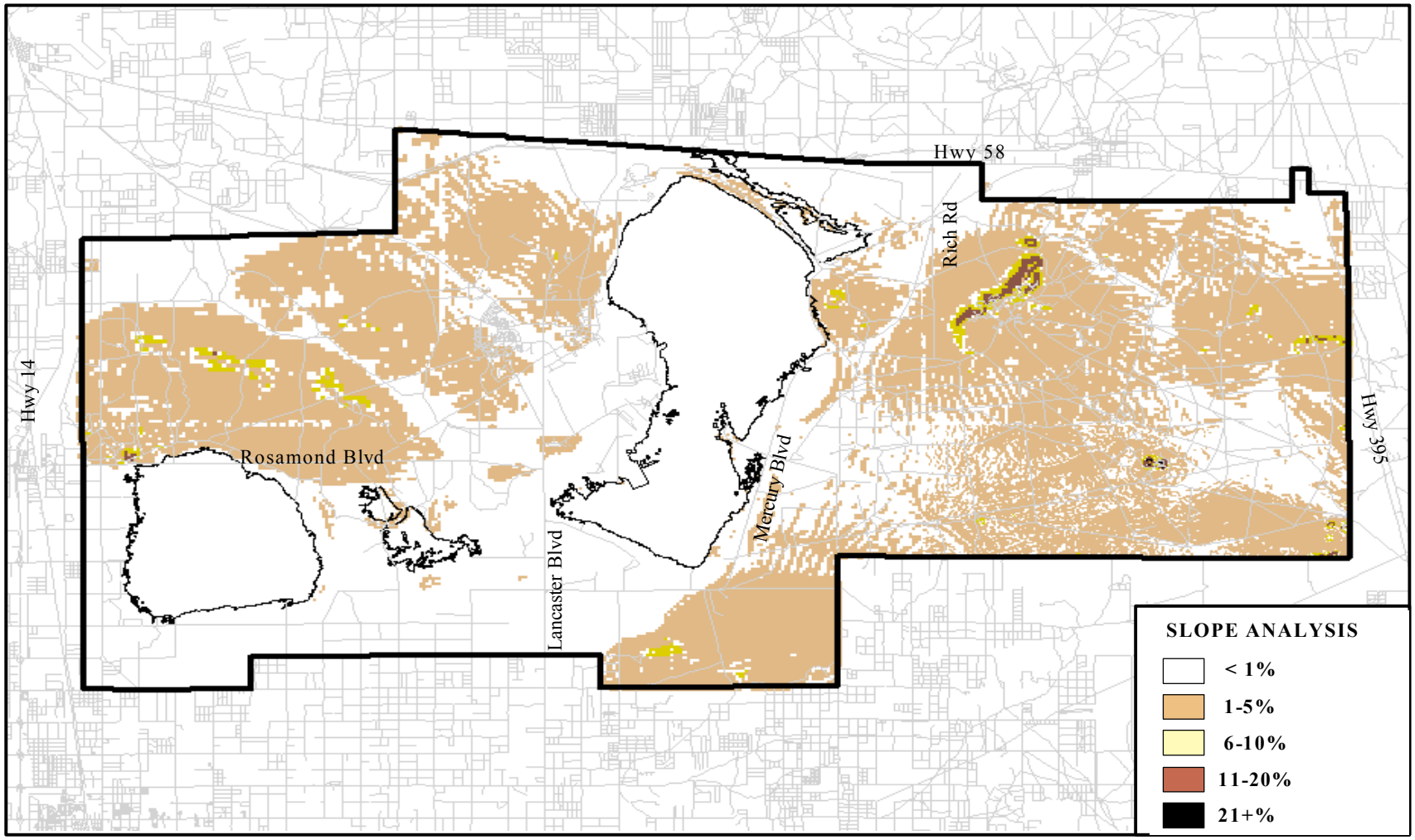


**Figure 4-1. Slope Analysis for Edwards AFB**

## 4.3 GEOLOGY AND SOILS

### 4.3.1 Geology

The general geology in the western Mojave Desert region, which includes Edwards AFB, can be grouped into three main divisions: granite and metamorphic rocks of pre-Tertiary age; volcanic, pyroclastic, and sedimentary rocks of Tertiary ages; and alluvial sediments of the Quaternary age. The alluvial sediments of Quaternary age lie unconformably on the Tertiary and pre-Tertiary rocks. In the valley areas they aggregate more than 1,000 feet in thickness. They are all clastic sediments derived from the underlying pre-Tertiary bedrock complex and Tertiary rocks, and range from fanglomerates (widespread, weakly consolidated accumulations of unsorted fragments, cobbles, and boulders in a sandy matrix and generally not stratified) to fine clays.

Edwards AFB is located in the Antelope Valley, a broad alluvial plain lying southwest of the Tehachapi Mountains and north of the San Gabriel Mountains. Low ranges of bedrock hills occasionally interrupt the generally flat terrain of the valley floor. Bedrock includes pre-Tertiary granitic and metamorphic rock, as well as Tertiary volcanic rocks and sedimentary formations. Portions of these hills contain carbonate strata that were important lithic resource areas for prehistoric populations. Only a thin residual soil has formed on areas of bedrock outcrop.

The lower flanks of the bedrock hills are blanketed by broad Quaternary-aged alluvial fans (bajadas) that extend to the valley floor. The fans consist of water-laid sand and gravel deposits. The valley floor comprises several closed topographic depressions presently containing three major playas: Rogers, Rosamond, and Buckhorn Dry Lakes. Playa deposits (thick, bedded clay and sand) interfinger with the encroaching alluvial fan deposits. Playa margins also have shoreline sand deposits, relics from wetter middle and late Pleistocene climates when the lakes were filled with water. Wind-laid deposits, which form in dunes and hummocks, are also frequent in the lower elevations. The dunes and hummocks are generally active, particularly where farming has disturbed the soil.

### 4.3.2 Soils

A preliminary soil survey conducted in 1987 to 1988 delineated soil types in the Main Base, family housing, and NASA DFRC areas. Surveys conducted in 1996 by the United States Natural Resource Conservation Service (U.S. NRCS) delineated soil types on the entire Base (U.S. NRCS 1996, U.S. NRCS 1997). Soils at Edwards AFB are typically alkaline, with pH values ranging from 7 to 8 for most soils and greater than 8 on lakebed soils. The high salinity and exchangeable sodium ion content of some soils, particularly soils in the lakebed basins, inhibit plant growth. The *Grazing and Cropland Management Plan* (U.S. NRCS 1997) was a study that identified five groups of landforms ranging from playas at the lowest elevation to hills and rock pediments, based on soil types. The relevant portions of the data in that study have been incorporated in Section 8 of this report. These landform groups are described briefly.

**Dry lakebeds** are most often covered by Wherry soils, about 95 percent. These areas include Rogers, Rosamond, and Buckhorn Dry Lakebeds. Wherry soils are deep and poorly drained, with

a clay texture and slopes of 0 to 1 percent. The soil is barren with high saline/sodic content, and is subject to flooding.

**Alluvial fans** in the areas surrounding the dry lakes are composed primarily of Leuhman, Norob, and Voyager soils. They are deep and moderately-well to well drained, with textures of fine sand to clay loam. Slopes range from 0 to 5 percent. These soils are saline and sodic, and subject to wind erosion and flooding.

**Dunes and sand sheets** around the dry lakes are an intermediate form between the alluvial flats and the fan piedmonts. They primarily consist of Cajon soil with smaller proportions of Challenger and other soils. These soils are deep, moderately-well to excessively drained, with textures of sand to loamy sand, subject to wind erosion. Slopes range from 0 to 15 percent.

**Fan piedmonts** contain mostly Helendale soil, with smaller proportions of Lavic, Destazo, Helendale Taxadjunct, and Cajon soils. These soils are deep and moderately-well to well drained, with textures of loamy coarse sand to fine sandy loam. Slopes range from 0 to 9 percent. These soils are subject to wind erosion and occasional flooding.

**Rock pediments and hills** consist of Randsburg, Hi Vista, Machone, Muroc, and Sparkhule soils, interspersed with rock outcrops. These soils can be very shallow to moderately deep and are well drained, with textures of sandy loam and gravel. Slopes range from 2 to 50 percent. These soils are subject to wind and water erosion.

## 4.4 WATER RESOURCES (NONJURISDICTIONAL)

Nonjurisdictional water resources at Edwards AFB include stormwater drainage/flood prone areas, treated wastewater, groundwater, imported surface water, artificial ponds supporting aquatic habitat and recreation, dry lakes, and ephemeral streams.

### 4.4.1 Stormwater Drainage/Flood Prone Areas

Edwards AFB is part of the 2,400-square-mile Antelope Valley. Rogers Dry Lake is the terminus for most of the stormwater runoff in this large, closed basin. Rainfall in the San Gabriel Mountains southwest of the Base, and in the Tehachapi Mountains northwest of the Base, drains in relatively well-defined streams toward the valley. Most storm activity is from the southwest, which is the migration pattern of regional precipitation systems, so runoff from this direction is generally greater. The streams flow to the relatively flat valley floor and transition to an overland sheet flow pattern. Sediments carried by the streams are deposited along the way, with coarse material (sand and gravel) dropped first, and fine material (silt and clay) transported farther downstream into the valley. The resulting landforms are the following:

a. transitional alluvial fans nearest the mountains with loamy, sandy, and gravelly sediments of high permeability,

b. desert plateaus toward the middle of the valley with sandy and silty sediments of intermediate permeability, and

c. playa lakebeds at the central low points of the valley with silty and clayey sediments of low permeability.

There is no outlet from the Rogers Dry Lake for runoff; stormwater must leave by evaporation or groundwater infiltration. In general, infiltration is limited by the low permeability of the lakebed.

There are no perennial streams on the Base. By the time the streams reach lower elevations, most of the water has evaporated or infiltrated. According to the *Stormwater Pollution Prevention Plan (SWPPP), Edwards Air Force Base, California* (AFFTC 1998b), the stormwater collection system on the Base consists of drainage ditches (flowing east to Rogers Dry Lake) and stormwater retention ponds (located on the west edge of Rogers Dry Lake). In 1993, a flood study of the Base was conducted to determine flood prone area constraints. This study was conducted in support of studies for the Programmatic Environmental Assessment (EA) for Basewide Implementation of the IRP, and for the *Edwards Air Force Base Comprehensive Plan* (USAF 1994a). In 2000, the Corps of Engineers completed a draft preliminary assessment of floodplains. The most critical flood prone areas were identified as the following:

a. Rogers Dry Lake,
b. Rosamond Dry Lake, and
c. Mojave Creek.

### 4.4.2 Dry Lakes

Rogers Dry Lake floods most winters, and the drainage pattern is toward the southern end of the lake. Once flooded, the lakebed tends to remain inundated the rest of the winter due to the low permeability of the lakebed soils. Although existing Base facilities need to be protected from flooding, the flood study notes that occasional moderate flooding is necessary to replenish and smooth the playa surface. A recent U.S. Geological Survey (USGS) study (USGS 1992) stated that water on the lakebed contains suspended sediment scoured from beds and banks of channels tributary to Rogers Dry Lake. Suspended sediment is also generated by erosion of the lakebed when the water mass is moved by the wind. The sediment helps fill surface irregularities when the suspended material is deposited on the lakebed as water evaporates. A study of the geomorphology of the dry lakebeds concluded that periodic flooding of the playas was critical for maintenance of smooth, hard pavement (DMA Consulting Engineers 1986). Inundation combined with wind moves sediment about the playa, heals surface cracking, and fills in fissures. This report noted that frequent shallow flooding occurring roughly once a year, with consistent winds, appears to be a prerequisite for maintaining a hard, compact lakebed surface (DMA Consulting Engineers 1986).

Microorganisms in the lakebed appear to provide critical protection to the lakebed surface from wind erosion. In an ideal and undisrupted system, the microorganisms become suspended in water with fine silts and are more or less evenly distributed over the lakebed surface prior to settling. When the sediments settle, the microorganisms act as a sediment-binding agent. Mission use of the lakebeds that result in surface disturbance, severe compaction, and changes to the natural flow into the lakebed may cumulatively contribute to the disruption of these organic lake binders. The

loss of these binding agents may promote lakebed surface erosion, exacerbating surface anomalies, and, perhaps, impairing the usefulness of the lakebed as a runway and for other mission-related activities. Changes to water flow into the lakebed and disturbance of the lakebed surface are also likely to impact invertebrate populations. This may result in loss of available habitat for invertebrates and the migratory birds and mammals that depend upon them.

The flood study (AFFTC 1993a) estimated a "flood of record" inundation elevation be used for planning purposes and for a risk of flooding analysis of existing Base facilities near Rogers Dry Lake. This level represents the maximum water surface elevation that will occur during a flood of reasonably high return interval (e.g., 50 years, 100 years). Because detailed hydrologic data were not available to support statistical or modeling approaches, a historical analysis was conducted using information obtained in Base personnel interviews and field reconnaissance. The level of flooding that occurred in 1943 was estimated to be the flood of record level. Most development at the Base is above this estimated flood level of 2,277.4 feet (North American Vertical Datum [NAVD] of 1988). Only a small portion of North Base and the NASA ramp are affected (Figure 4-2). Relatively high flooding in 1993 remained more than 3 feet below the estimated flood of record level.

Rosamond Dry Lake also floods seasonally. Based on historical analysis, a planning flood level of 2,279 feet (NAVD 1988) was estimated for this dry lakebed. This level is approximately 1 foot above winter 1992-1993 flood elevations and is 6 inches higher than Rosamond Boulevard, which crosses the northern portion of the lakebed. The planning flood level was set above the roadway because wave action on floodwaters caused the road to be overtopped in 1993. Increased development could produce increased runoff to the lakebed.

The 1993 flood study noted that it appears unlikely that Rosamond and Rogers Dry Lakes are connected, due to the separating ridge upon which Buckhorn Dry Lake is perched. This small, dry lake was not addressed in the 1993 flood study because the area is not developed or used and only a relatively small amount of ponding occurs.

### 4.4.3 Ephemeral Streams

Mojave Creek is a relatively well-defined drainage course that connects the approximately 200-square-mile Mojave-Soledad Mountain Drainage Area to Rogers Dry Lake. The drainage channel extends through residential areas and parallels Lancaster Boulevard south of the intersection with Rosamond Boulevard. The flow fans out near Rogers Dry Lake. A facility of particular concern for the 1993 flood study was the Anechoic Chamber near Lancaster Boulevard and Wolfe Avenue.

Unlike flooding in the dry lakebeds, flooding along Mojave Creek is not a seasonal occurrence. Usually the channel is dry. However, the creek causes periodic flooding during high-intensity storms. A theoretical approach was taken to estimate a flood discharge of 4,000 cubic feet per second (cfs). Hydraulic modeling using HEC-2, an open-channel flow model, was then applied to estimate the boundaries of the 100-year floodplain. As shown on figure 4-2, the northeastern portion of the residential area near Mojave Boulevard and Forbes Avenue would be subject to

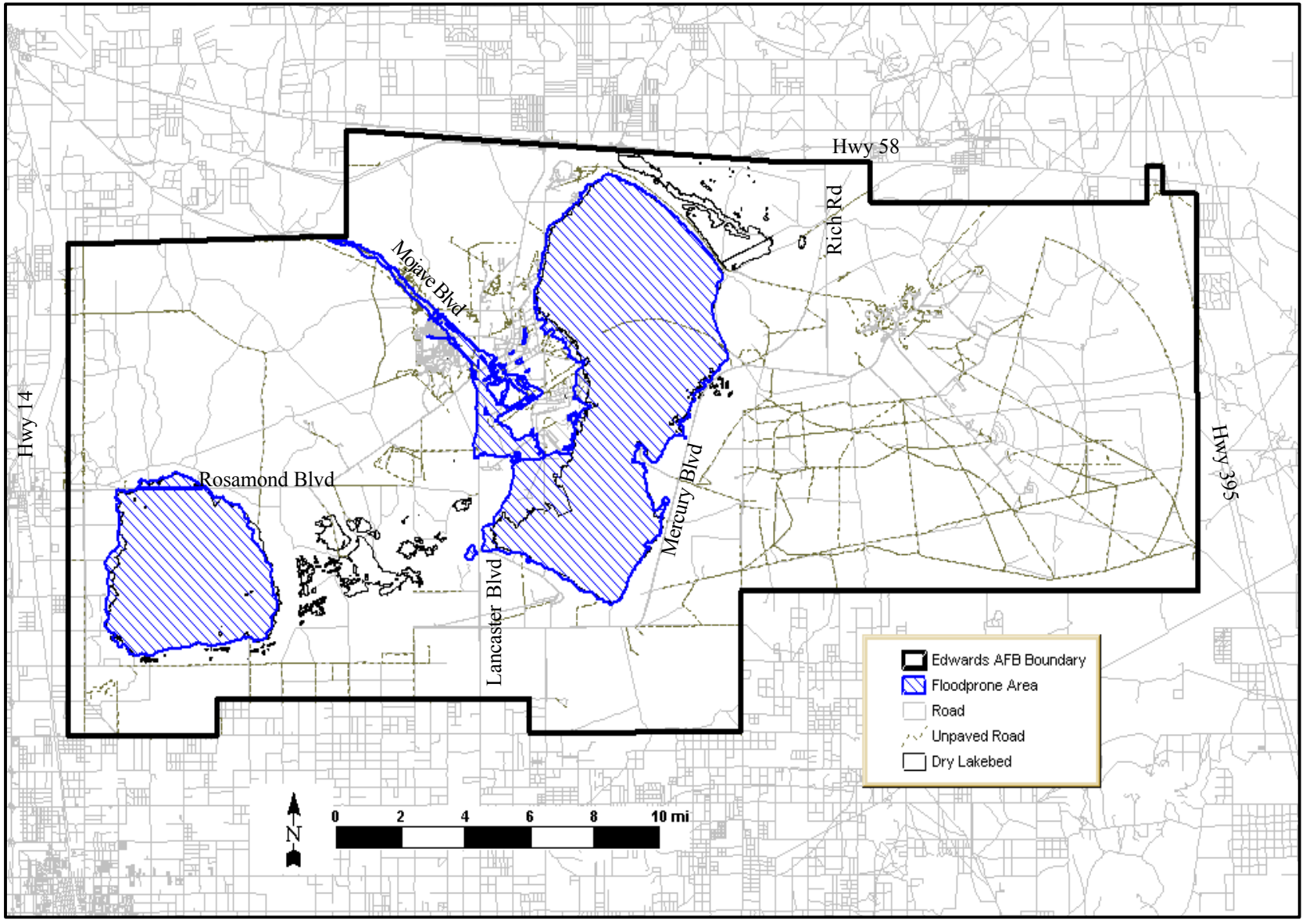


**Figure 4-2. Flood Prone Areas on Edwards AFB**

flooding from a 100-year event. However, the Anechoic Chamber was found to be above the 100-year water surface elevation.

### 4.4.4 Artificial Waters

Piute Ponds, in the southwestern corner of the Base, is the largest body of water on the Base. The ponds are fed by effluent from the Lancaster Water Reclamation Plants, which provide secondary treatment, and by occasional flooding of Amargosa and Little Rock Wash. Recreational opportunities at this site include group tours and individual viewing by bird watchers and naturalists, and waterfowl hunting (refer to section 11).

Branch Memorial Park Pond, in the south-central portion of the Base between Rogers and Buckhorn Dry Lakes, was constructed in the late 1960s as a fishpond. The 5-acre pond is 4 to 14 feet deep, and is fed by nonpotable water from the Branch Park Well Field. Fishing is allowed at the pond, which is stocked with fish. Water resource issues at the pond include excessive seepage through the porous soils on the bottom. Water loss is also occurring through evapotranspiration by certain plants. Tamarisk and cottonwood are the predominant riparian plants at the pond. Tamarisk is an exotic phreatophyte (a deep-rooted plant that obtains its water from the water table or the layer of soil just above it) and consumes relatively large amounts of water. It is invasive, out competing native vegetation.

### 4.4.5 Treated Wastewater Effluent

Treated wastewater effluent is the source of reclaimed water which is a growing source of water supply in Southern California. Edwards AFB reclaimed water supply is used for some urban landscape irrigation and feeds some artificial ponds as detailed in the previous section. In addition to the effluent from off-Base sources, which feeds Piute Ponds, effluent is also produced on Base.

### 4.4.6 Groundwater Occurrence

The occurrence of groundwater and the characteristics of aquifers underlying and near Edwards AFB are keyed to the basic geology of Antelope Valley. The Antelope Valley is an example of a single, undrained, closed basin (USGS 1995a). As discussed in Section 4.3, alluvial fans consisting of water-laid sand and gravel deposits spread out near the Tehachapi and San Gabriel Mountains. Progressively finer materials (silts and clays) extend into the valley, and the finest, least permeable deposits lie in the closed topographic playas of Rogers, Rosamond, and Buckhorn Dry Lakes. During the depositional history of the Antelope Valley, a large intermittent lake occupied the central part of the basin and was the site of accumulation of fine-grained material. These lacustrine (lake-related) deposits of thick layers of blue-green silty clay and brown clay accumulated when a relatively large lake or marsh covered parts of the valley. Although thick layers of alluvium cover the lacustrine deposits in the southern part of Antelope Valley, these sediments are exposed at land surface in the north (USGS 1993).

**Groundwater Recharge.** The principal source of recharge to the aquifer system in the Lancaster subbasin is infiltration of rainfall runoff through the alluvial fans of creeks flowing off the San Gabriel Mountains on the southern boundary of the Antelope Valley (USGS 1995b). Estimates of

total annual recharge to Antelope Valley groundwater basins range from approximately 40,000 to 80,000 acre-feet per year. The lower estimate of 41,000 acre-feet per year is probably more representative as it is based on longer-term discharge and climatological data (USGS 1993). Recharge from infiltration in the hills on the eastern and northwestern parts of the Edwards AFB area is minimal because precipitation is low and evaporation is high, although some recharge may occur along ephemeral stream channels (USGS 1995b). Major faults that cut the alluvial deposits in the Antelope Valley act as partial barriers to the movement of groundwater. Water-level differences of more than 300 feet in the same aquifer may be present. Along many of the smaller faults, the water table is several tens of feet higher on the upgradient side of the fault than on the downgradient side. Stormwater may also enter the groundwater directly through giant desiccation cracks and fissures, but this is probably a small source of recharge because of the generally low permeability of the lakebed surface (USGS 1995b).

**Groundwater Use on Edwards AFB**. Groundwater has been a source of water to the Base since 1947, when a total of 600 acre-feet was pumped annually. Groundwater use peaked in 1978 at 6,300 acre-feet, and has varied from around 6,000 to 3,500 acre-feet since then (USGS 1995a). Edwards AFB currently uses 15 groundwater wells, of which 10 provide drinking water. South Track, near the southern boundary of Rogers Dry Lake, has eight of the wells in production and taps the deep aquifer to provide potable water to the main Base (Figure 4-3). In 1998, Edwards AFB groundwater wells produced a total of 787,869,000 gallons of drinking water from eight wells and 13,491,300 gallons of nonpotable water from three wells (Speaks 1999). In 1998, AFRL groundwater wells produced a total of 5.9 million gallons of drinking water (AFFTC 1998a).

### 4.4.7 Surface Water Supply

Imported surface water was first delivered to the Antelope Valley in 1972, when State Water Project water was brought through the California Aqueduct to Littlerock Creek Irrigation District and AVEK. Edwards AFB purchases water from AVEK. An AVEK supply line north of the Base, located along State Route 58, provides water to a new 20-inch supply line, which in turn supplies water to the North Base storage tanks (AFFTC 1998b). The water supplier requires that Edwards AFB purchase a minimum of 2.0 million gallons per day (mgd), and limits the Base's maximum allotment to 4.0 mgd (AFFTC 1998b). However, there are no guarantees on this supply of water. Exports from the Sacramento-San Joaquin Delta may be reduced in the future. Also, AVEK serves several communities outside of the Antelope Valley, including California City to the north, and Agua Dulce, Vincent, and Acton to the southwest. California City's population increased from approximately 7,400 in 1980 to 15,000 in 1990, and is projected to reach 36,000 in 2010. These increasing demands may reduce the amount of imported water available to the Antelope Valley, including Edwards AFB (USGS 1995a).

The average daily water demand on the Base has been reported as 4.0 mgd (approximately 4,500 acre-feet per year) (AFFTC 1998b), which normally can be supplied by imported surface water. However, the demand is much higher in the summer. Peak summer use is approximately 12 mgd. Therefore, groundwater pumpage is still required. There are 20 surface drainage basins delineated on Edwards AFB (Figure 4-4).

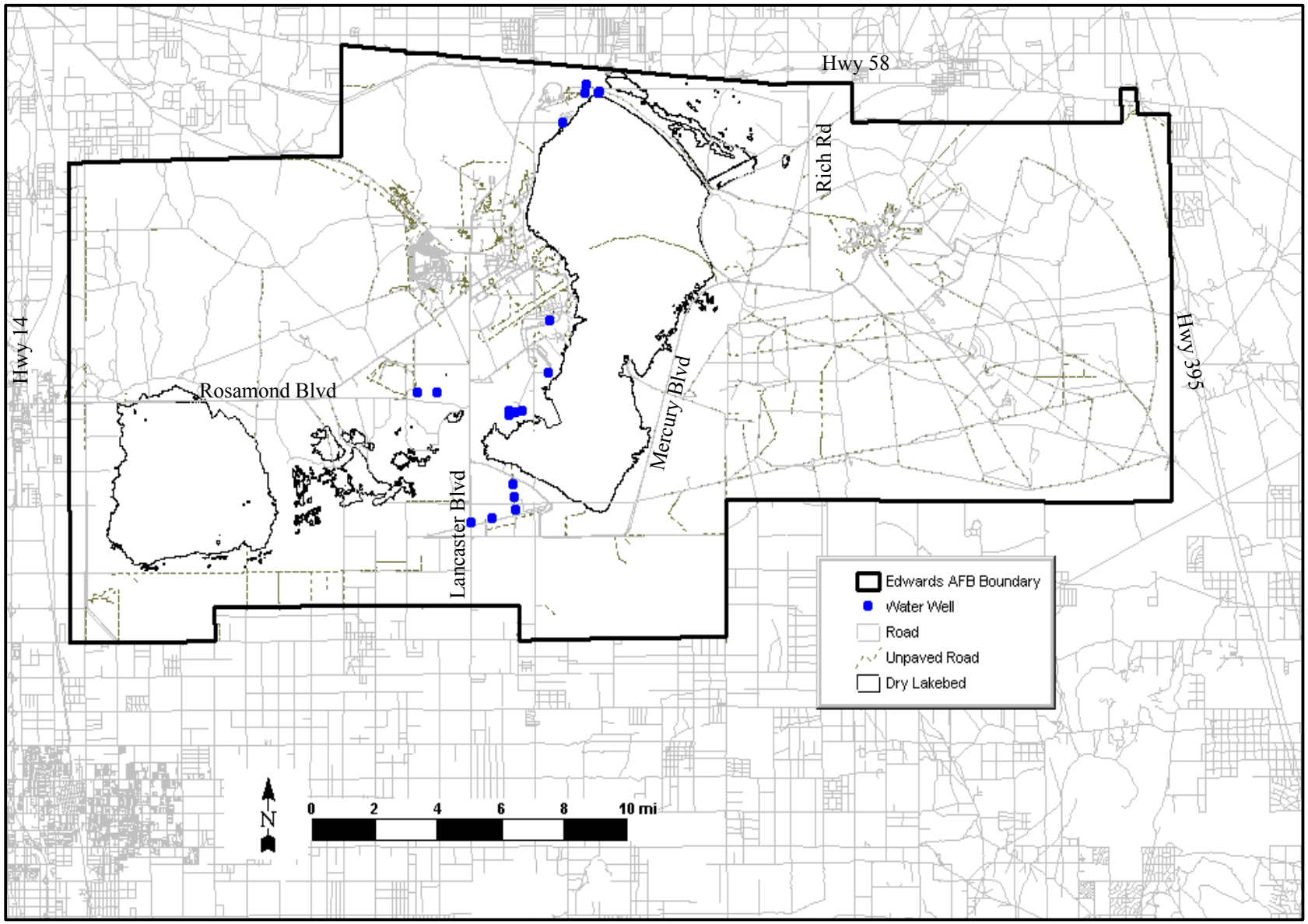


**Figure 4-3. Location of Well Fields on Edwards AFB**

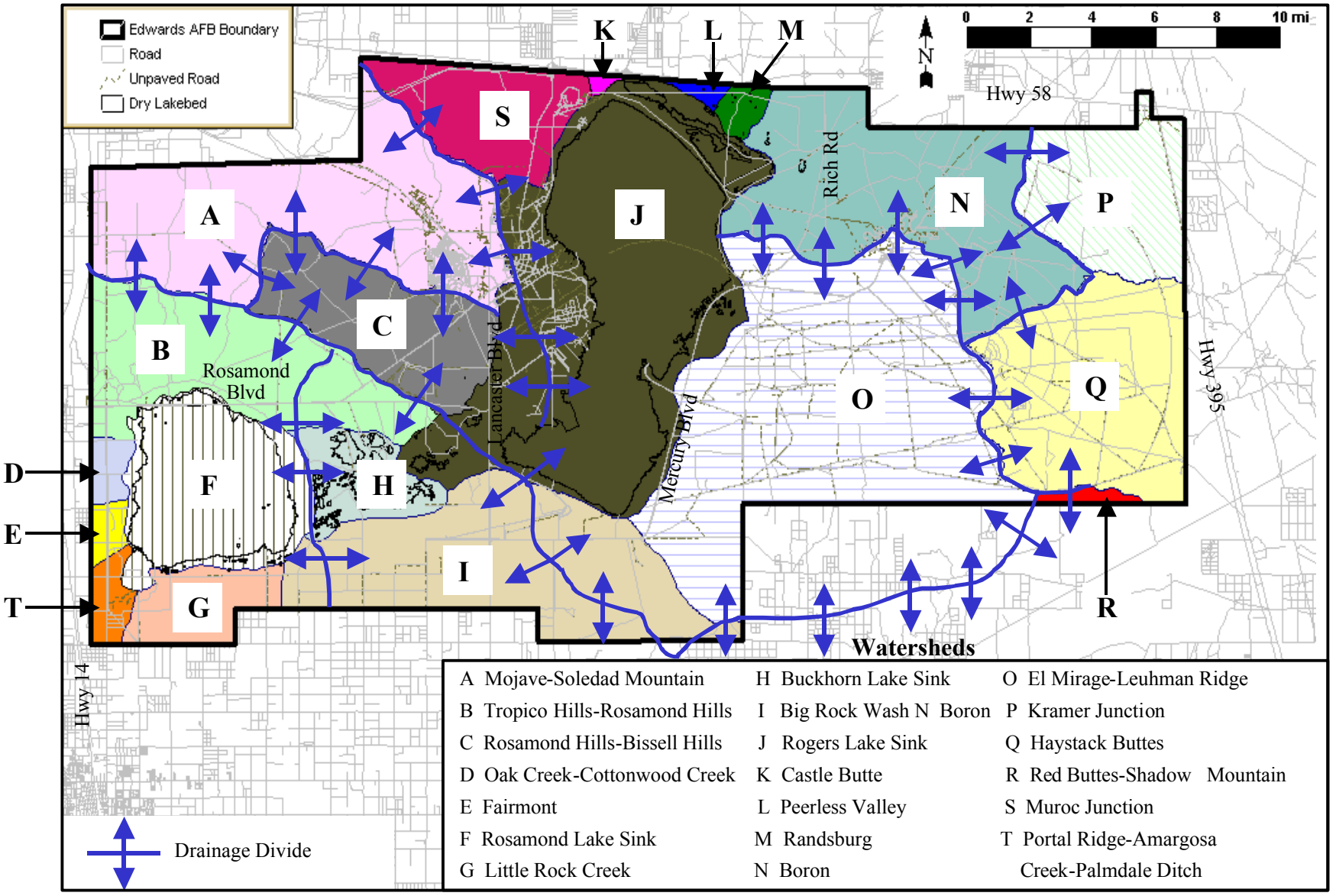


**Figure 4-4. Surface Water Drainage Basins (Watersheds) on Edwards AFB**

## 4.5 BIOTIC ENVIRONMENT

Edwards AFB contains several natural vegetation types (zonal/azonal habitats) comprising natural plant and animal communities, vegetation subassociations, geophytic and hydrologic areas, and developed portions of the Base (Figure 4-5). The natural distribution of habitats on Base is dependent on topography, moisture, disturbance, and other largely abiotic factors. Typically, the Base is described in terms of five major zonal habitats: arid-phase saltbush scrub, halophytic-phase saltbush scrub, creosote bush scrub, lakebeds, and Joshua tree woodland. The Base also supports several azonal (isolated) habitats such as claypan and dunes and mesquite woodlands. These habitats support a variety of plants and animals.

Numerous biological resource surveys have been conducted on Base. These include both generalized and focused surveys to develop management approach and strategy, to provide baseline data for biological opinions, to meet the requirements of environmental documentation in the EIAP process, and for planning purposes. The results of several Basewide surveys are summarized in the *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis* (Mitchell, et al. 1993). The findings of these surveys are summarized in the descriptions of wildlife and vegetation provided in the following sections.

### 4.5.1 Vegetation (Zonal and Azonal) Habitats

Zonal and azonal habitats have been mapped and incorporated into GIS databases during several survey efforts, including Mitchell, et al. 1993 and a *Botanical Resource Study of Complex 1 Charlie, Edwards AFB* (AFFTC 1994a). Over 200 plant species identified on Edwards AFB have been listed in *Plant Species of Edwards Air Force Base* (AFFTC 1992). Detailed vegetation descriptions can be found in Mitchell, et al. 1993. The results of vegetation mapping efforts are illustrated by Figure 4-5. A regional vegetation prospective is provided in Figure 4-6. Zonal and azonal habitats, distribution on Base, and associated dominant plants are discussed in this section.

#### 4.5.1.1 Zonal Habitats

Zonal habitats include natural plant and wildlife associations that have areal distributions limited by elevation, slope, and aspect. Combined, the distribution of these habitats encompasses most of the undisturbed portions of the Base.

**Joshua Tree Woodlands.** Joshua tree woodlands are most prevalent east of Rogers Dry Lake, with smaller patches occurring in the northwest (see figure 4-5). Joshua tree woodland is distributed on gentle hills and rises, and on valley floors of upper bajadas and sandy areas. This plant community's distribution appears to be the result of favorable soil conditions that allow seedling survival.

Typically, Joshua tree woodland understories include saltbush, or creosote bush; Joshua trees (*Yucca brevifolia*) provide an important vertical habitat component for wildlife. The understory supports a high diversity of annual plant species, including the native desert dandelion (*Malacothrix glabrata*), pincushion (*Chaenactis* sp.), and fiddleneck (*Amsinckia tesselata*).

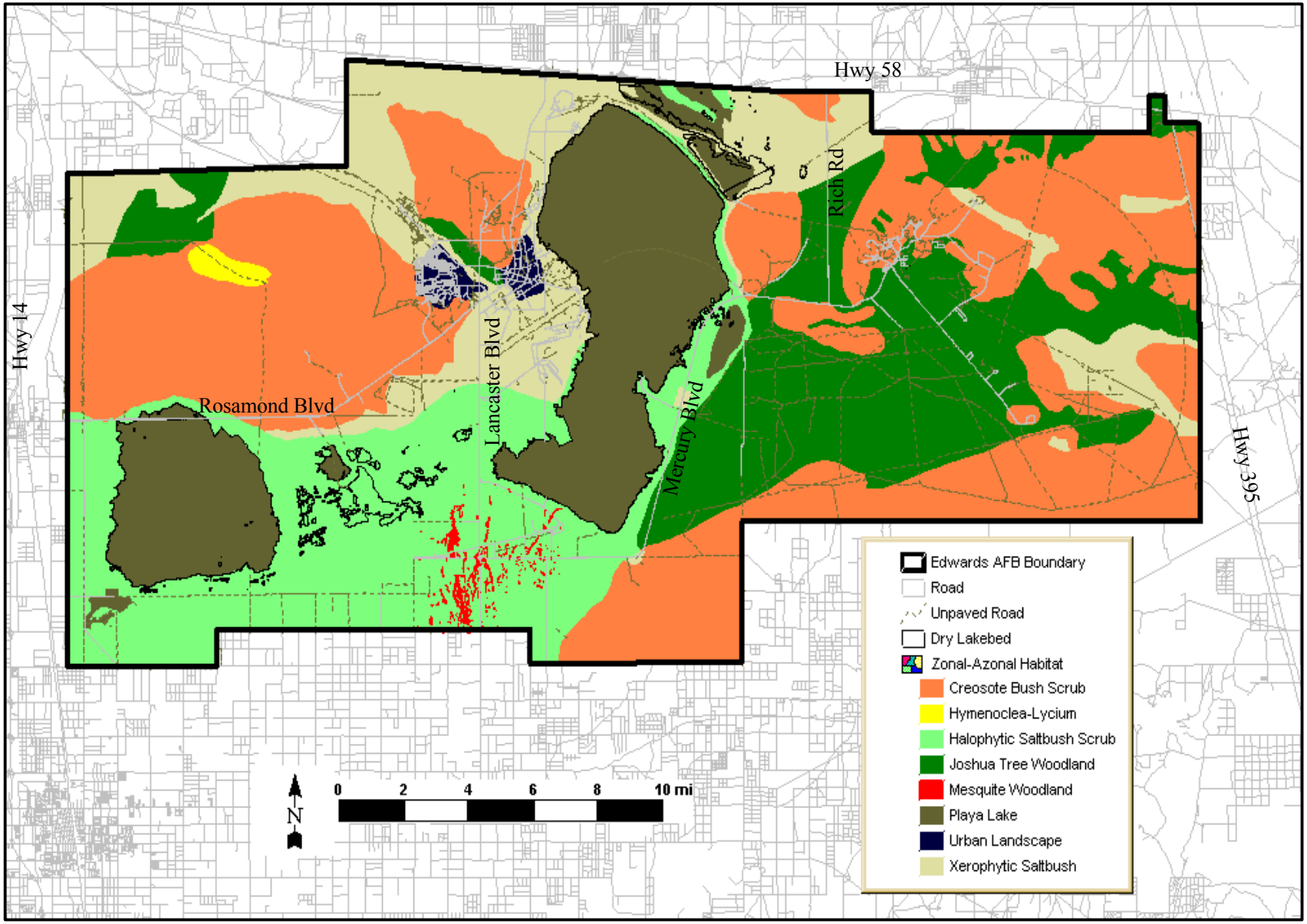


**Figure 4-5. Edwards AFB Detailed Vegetation Map**

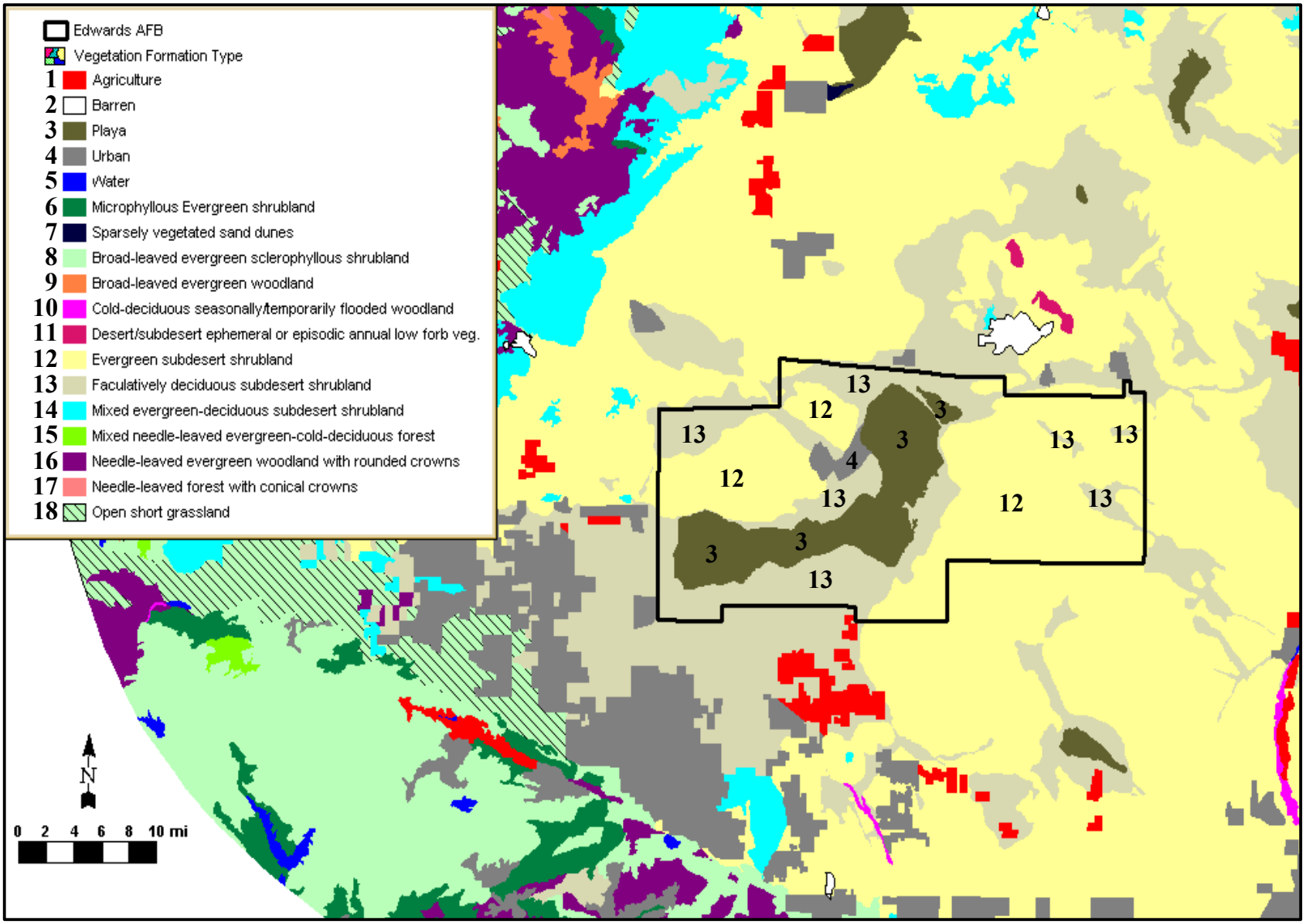


**Figure 4-6. Regional Vegetation Map for the Mojave Desert Surrounding Edwards AFB**

**Creosote Bush Scrub.** Creosote bush scrub is dominated by creosote bush (*Larrea tridentata*). It occurs under the same or similar edaphic (soil) conditions as Joshua tree woodlands and is the most common understory for that community. Creosote bush scrub is distributed throughout the northwestern and eastern portions of the Base and supports the highest plant diversity on Base (Mitchell, et al. 1993). Common associated species include burrobush (*Ambrosia dumosa*), winterfat (*Krascheninnikovia lanata*), cheesebush (*Hymenoclea salsola*) and Nevada tea (*Ephedra nevadensis*).

**Xerophytic-Phase Saltbush Scrub.** The undeveloped portions of Main Base and South Base and the northern parts of the Base support Xerophytic-phase or dryland saltbush scrub (see figure 4-5). This plant community is dominated by allscale (*Atriplex polycarpa*) with goldenhead (*Acamptopappus sphaerocephalus*) and cheesebush as common associates.

**Halophytic-Phase Saltbush Scrub.** Halophytic-phase saltbush scrub is the dominant habitat on the southwest portion of the Base (see figure 4-5). It also occurs in narrow bands around dry lakebeds and in claypan and dune complex areas. Halophytic-phase saltbush scrub occurs in high pH soils and is dominated by plant species adapted to tolerate these conditions. Common plants of halophytic-phase saltbush scrub include shadscale (*Atriplex confertifolia*) and four-wing saltbush (*A. canescens*) (although spinescale [*A. spinifera*] and quailbush [*A. lentiformis*] are common saltbushes of this community), alkali goldenbush (*Isocoma acradenia* spp. *acradenia*) and rubber rabbitbrush (*Chrysothamnus nauseosus*). The understory is composed primarily of kochia (*Kochia californica*), wild rye (*Elymus cinereus*), saltgrass (*Distichlis spicata*), goldfields (*Lasthenia californica*), and alkali pineappleweed (*Chamomilla occidentalis*).

**Lakebeds, Claypans, and Dunes.** A rich continuum of playas, claypans, lakebeds and dunes occurs from Piute Ponds in the southwestern corner of the Base, through Rosamond and Rogers Dry Lakes, to an area between the northeastern limits of Rogers Dry Lake and Rich Road. Smaller playas and claypans are found throughout the remainder of the Base (Figure 4-7).

#### 4.5.1.2 Azonal Habitats

Azonal habitats are those natural and human-influenced plant and wildlife associations that are not necessarily restricted by elevation, but rather by other biotic and abiotic factors such as presence of water and/or human disturbance. These habitat designations are a refinement of zonal habitats.

**Dry Wash With Mesquite Woodlands.** Mesquite woodlands, a relatively spatially restricted habitat, occur on the more mesic washes and drainages within the halophytic-phase saltbush scrub in the southwestern portion of the Base (see figure 4-7). The dominant species is mesquite (*Prosopis glandulosa* var. *torreyana*), although Great Basin sagebrush (*Artemesia tridentata*) is also common in these woodlands.

**Dry Wash Without Mesquite Woodlands.** Much of Edwards AFB's natural and intricate drainage network lacks mesquite woodlands. These washes, however, still provide habitat for perturbance-dependent plants and burrowing animals and may support species that are common in wet areas such as rabbitbrush (*Chrysothamnus nauseosus*).

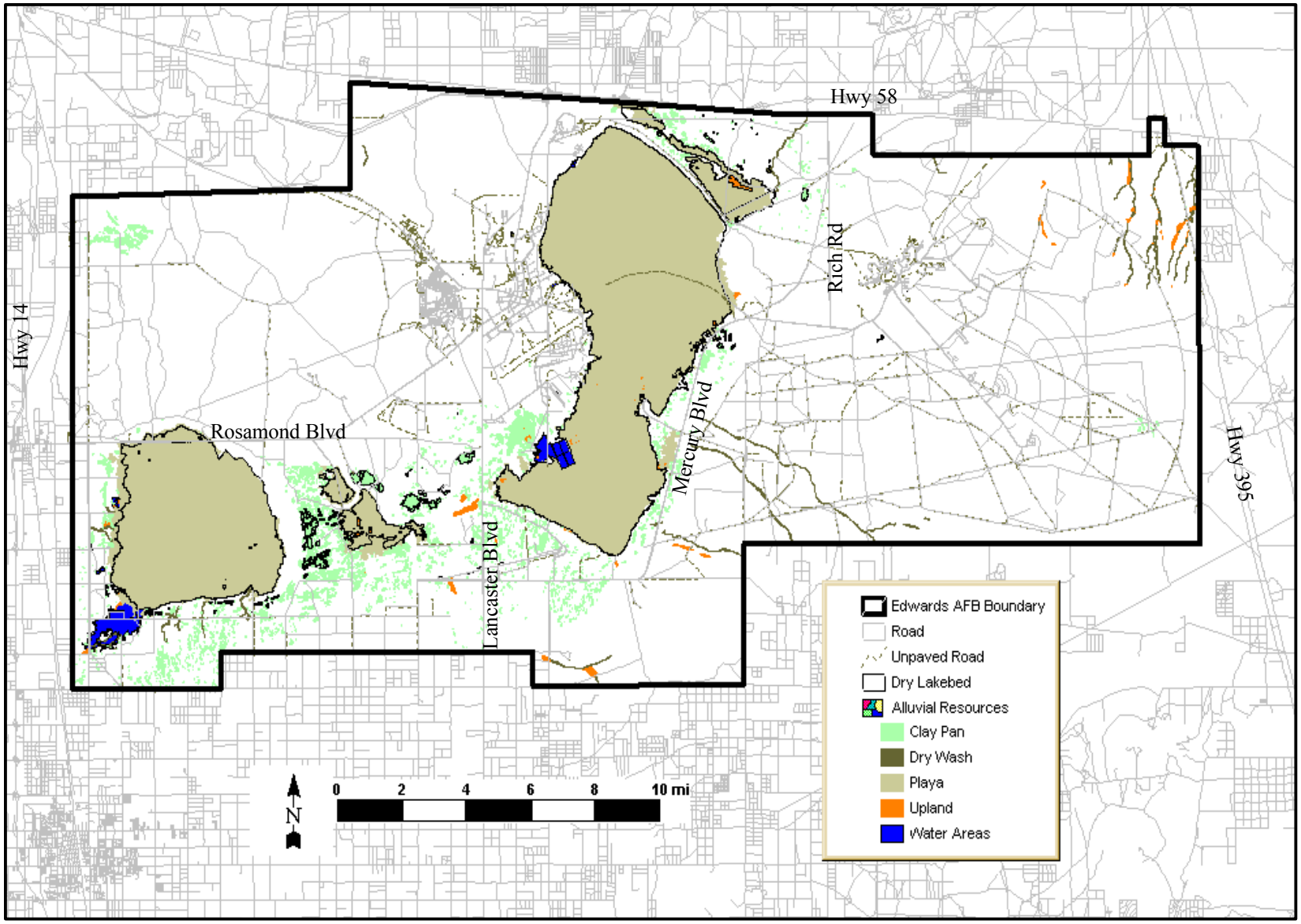


**Figure 4-7. Alluvial Resources by Type on Edwards AFB**

**Hymenoclea-Lycium Scrub.** Cheesebush (*Hymenoclea salsola*) and peachthorn (*Lycium cooperi*) are small to medium-sized, sparsely leaved shrub of washes and low areas in the Mojave Desert. It ranges through several communities, including creosote bush scrub, Joshua tree woodlands, and shadscale scrub on Edwards AFB, but are more common in the northwest portion of Base.

**Artificial Aquatic Habitats.** Ponds supporting aquatic habitats are rare, usually man-made habitats (on Edwards Air Force Base) that support hydrophytic plants, including bullrushes (*Scirpus* spp.), cattails (*Typha* spp.), and rushes (*Juncus* spp.) (see figure 4-7). The natural vegetation can grow rather dense within man-made ponds, requiring that they be periodically maintained.

**Urban Landscape (Ruderal).** Certain nonnative invasive plants, such as Russian thistle (*Salsola tragus*), red brome (*Bromus rubens*), tansy mustard (*Descurrania pinnata*), and split grass (*Schismus barbatus*) are common in disturbed portions of natural habitats throughout the Base. Other nonnative plants include ornamentals planted as landscaping around buildings and other developed areas. Planted species include Eucalyptus (*Eucalyptus* spp.) and several species of pine (*Pinus* spp.).

**Rock Outcrops and Hillsides.** Rock outcrops and hillsides are found in several places on Base particularly Red Hills, Leuhman Ridge, and Bissell Hills. Although the vegetation on hillsides and near (or on) rock outcrops is generally the same as the dominant surrounding vegetation, rock outcrops and hillsides may provide a mesic (moist) habitat for certain plants and wildlife.

**Caves and Mines.** Caves and mines are not natural habitat for plants, but provide suitable habitat for denning and roosting animals such as mammals, bats, and owls.

**Dunes**. Two types of dunes occur on Edwards AFB, active and stabilized (or partially stabilized) desert dunes. Active dunes are essentially barren expanses of actively moving sand whose size and shape are determined by abiotic site factors rather than stabilizing vegetation (Holland 1986). Although essentially barren, active dunes may support bugseed (*Dicoria canescens*), creeping primrose (*Oenothera avita*), and plaited coldenia (*Tiquilia plicata*).

**Claypans.** Claypans are generally devoid of natural vegetation, although edges may support a number of plants adapted to wet conditions including inkweed (*Suaedea moquinii*), kochia (*Kochia californica*), desert alyssum (*Lepidium fremontii*), and Chinese pusley (*Heliotropium currasavicum*). The claypans do, however, support a unique and complex nonvascular flora adapted to seasonal playa hydration and desiccation (see figure 4-7).

**Alluvial Fans.** The vegetation on alluvial fans is generally the same as the dominant surrounding vegetation. Alluvial fans may also provide a mesic (moist) habitat for certain plants and wildlife. Alluvial fans are critical areas for natural flow and vegetation on alluvial fans contributes to erosion control.

**Alkali Meadow.** Alkali meadows support a dense to fairly open growth of perennial grasses and sedges on, more or less permanently moist, alkaline soils. Generally more common in areas of saltbush scrub, alkali meadows normally support low-growing grasses and forbs such as saltgrass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*), and pickleweed (*Allenrolfea occidentalis*).

**Ditches and Canals.** Ditches and canals include areas that support seasonal or permanent water. The presence of permanent or seasonally flowing or ponded water generally precludes the growth of upland plants. Plants adapted to these areas include cattails (*Typha* spp.), cottonwood (*Populus fremontii*), common reed (*Phragmites australis*), and rushes (*Juncus* spp.).

### 4.5.2 Sensitive Habitats

Sensitive habitats located on Edwards AFB include designated critical habitat for desert tortoise, playas and pans, areas of significant topographic relief, sensitive plant populations, Significant Ecological Areas (SEAs) as defined by the county of Los Angeles, and yardangs, which are streamlined, wind-eroded ridges.

Approximately 65,000 acres (100 square miles or 21 percent) of the Base fall within the Fremont-Kramer Desert Tortoise Critical Habitat Unit, one of 12 critical habitat units in the southwestern United States. The USFWS guidelines for the management area recommend a goal of no net loss of habitat. On Base, critical habitat encompasses portions of the PIRA, AFRL, and the Mount Mesa area (Figure 4-8).

Within the Base boundaries, critical habitat is present within the PIRA desert tortoise management zones, although these zones extend beyond critical habitat areas (figure 4-8). The PIRA is divided into three management zones (USFWS 1994c) that roughly correspond with mission use in each zone (see figure 4-8). The heaviest use within the PIRA and critical habitat is a 4,480-acre area designated Zone 1. Activities within Zone 1 are not expected to preclude the recovery of desert tortoise in the Western Mojave Desert. Approximately 25,960 acres of critical habitat fall within an area designated Zone 2, which supports moderate tortoise densities. The moderate level of activity currently occurring within this zone is expected to continue at its current rate. Zone 3 encompasses 30,360 acres of the PIRA and contains the highest tortoise densities on Base. Zone 3 provides for the highest level of desert tortoise protection, and very little activity occurs within this area. Zone 3 also includes the Mount Mesa area, an area designated by Edwards AFB as a desert tortoise buffer area.

Several areas of local topographic relief occur on Base, including Leuhman Ridge (see figure 4-1), Rosamond and Bissell Hills, and the cliffs just to the north of Rosamond Dry Lake. These areas contain nesting habitats for raptors and shelter areas for many mammal species (e.g., prairie falcon, little brown bat, and bobcat [*Felis rufus*]). These areas also contain relatively large populations of sensitive plants (see Appendix C).

Los Angeles County has identified two SEAs on Edwards AFB. Piute Ponds (SEA 50), in the southwestern corner, supports a significant number of waterfowl and provides a stopover area for

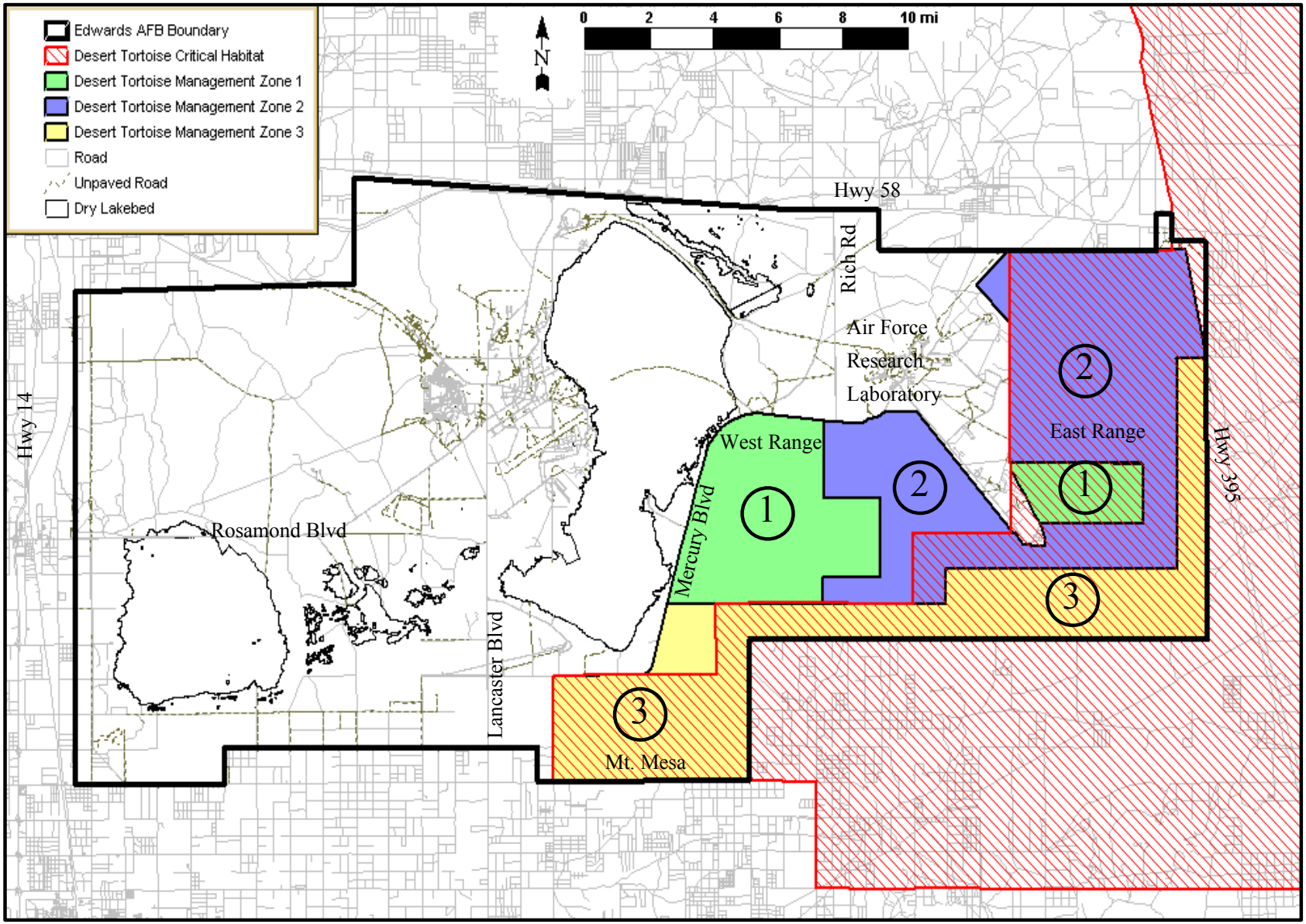


**Figure 4-8. Desert Tortoise Critical Habitat on Edwards AFB**

migratory bird species. The mesquite woodlands near Edwards AFB South Gate is also a rare plant community within Los Angeles County and has been designated SEA 47.

Yardangs are streamlined, wind-eroded ridges commonly cut into moderately consolidated rocks of Pleistocene and Holocene age, but are also found in Tertiary sandstones, and rarely in older indurated rocks. These landforms are formed and preserved under unique conditions and are particularly useful for understanding climate change over the last several thousand years. On Edwards AFB, the yardangs are a series of northeast/southwest oriented streamlined hills carved into the moderately consolidated materials northeast of Rogers Dry Lake. Yardangs are known in all major deserts of the world.

### 4.5.3 Wildlife

A large number of inventories and surveys have been completed at Edwards AFB. Appendix C contains a summary of them by taxonomic grouping. Table 4-1 summarizes the wildlife species found on Base. Exotic plant species are listed at Appendix E.

**Table 4-1.**
**Species of Interest on Edwards AFB**

| Scientific Name | Common Name | Federal Status | State Status | CNPS Status | Habitat Preference |
|---|---|---|---|---|---|
| **Plants** | | | | | |
| *Calochortus striatus* | Alkali mariposa lily | None | None | List 1B | Claypans and sand dunes, especially drainages, in halophytic saltbush scrub. |
| *Cymopterus deserticola* | Desert cymopterus | None | None | List 1B | Sandy swales and along sandy washes; Joshua tree woodland. |
| *Eriophyllum mohavense* | Barstow woolly sunflower | None | None | List 1B | Rises between sinks in xerophytic saltbush scrub. |
| *Muilla coronata* | Crowned onion | None | None | List 4 | Water saturated soils in xerophytic saltbush scrub. |
| *Chorizanthe spinosa* | Mojave spineflower | None | None | List 4 | Bare slopes and flats in saltbush scrub. |
| *Eriastrum pluriflorum* spp. *Sherman-hoytae* | Many-flowered sapphire flower | None | None | List 4 | Uncommon plant of chaparral, other scrub, woodlands, and forests. |
| *Goodmania luteola* | Yellow spiny cape | None | None | List 4 | Western Mojave Desert, salt-crusted sand dunes in halophytic saltbush scrub. |
| *Loeflingia squarrosa* var. *artemisiarum* | Sage-like loeflingia | None | None | List 1B | Sand dunes in halophytic saltbush scrub. |
| *Astragalus preussii* var. *laxiflorus* | Lancaster milkvetch | None | None | List 1B | Areas of high water table in halophytic saltbrush scrub. |

**Table 4-1 (Continued).**
**Species of Interest on Edwards AFB**

| Scientific Name | Common Name | Federal Status | State Status | CNPS Status | Habitat Preference |
|---|---|---|---|---|---|
| **Reptiles and Amphibians** | | | | | |
| *Gopherus agassizii* | Desert tortoise | FT | ST | --- | Basewide with densities varying by habitat; halophytic-phase saltbush has the lowest density; creosote bush scrub the highest |
| *Sauromalus obesus* | Chuckwalla | FSS | CS | --- | Associated with rock outcrops. Likely limited to rock outcrops associated with ridges (e.g., Leuhman Ridge). |
| *Phrynosoma coronatum frontale* | California horned lizard | None | CS | --- | Ponds, slow-moving streams. Piute Ponds and Branch Pond on Edwards AFB. |
| *Uma scoparia* | Mojave fringe-toed lizard | None | CS | --- | Associated with sand deposits. Likely limited to dunes in the north-central and south-central part of the Base. |
| **Birds** | | | | | |
| *Accipiter cooperi* | Cooper's hawk | None | CS | --- | (Nesting) Relatively rare on Base. Associated with Piute Ponds area, woodlands near Haystack Butte, and similar habitats on Base. |
| *Aquila chrysaetos* | Golden eagle | Protected under Golden & Bald Eagle Act | CS | --- | Migratory, foraging on Base in winter but may also nest on lofty rocky ridges on the northern portions of the Base. |
| *Haliaeetus leucocephalus* | Bald Eagle | FT | SE | --- | Transient. Rarely observed. |
| *Buteo regalis* | Ferruginous hawk | FSS | CS | --- | Migratory, forages in open relatively flat areas on Base in winter. |
| *Circus cyaneus* | Northern harrier | None | CS | --- | (Nesting) Found in all habitat zones, but commonly found near aquatic habitats such as Piute Ponds; may nest on Base. |
| *Falco peregrinus anatum* | Peregrine falcon | Delisted (formally endangered) | SE | --- | Uncommon transient observed on Piutes Ponds and near Leuhman Ridge; not known to nest on Base. |
| *Falco mexicanus* | Prairie falcon | None | CS | --- | Found in all habitat zones. May nest at AFRL. |
| *Asio flammeus* | Short-eared owl | None | CS | --- | At least three records on Base, two at Piute Ponds. Usually associated with wetland habitat. |

**Table 4-1 (Continued).**
**Species of Interest on Edwards AFB**

| Scientific Name | Common Name | Federal Status | State Status | CNPS Status | Habitat Preference |
|---|---|---|---|---|---|
| *Asio otus* | Long-eared owl | None | CS | --- | Found in wooded areas such as woodlands near Haystack Butte and Mesquite woodlands. Also observed at the South Base evaporation ponds. |
| *Speotyto cunicularia* | Burrowing owl | None | CS | --- | Flat open areas, associated with small mammal, man-made, and desert tortoise burrows throughout the Base. |
| *Chaetura vauxi* | Vaux's swift | None | CS | --- | Migratory, forages on Base in winter. Not likely to alight anywhere on Base. |
| *Toxostoma lecontei* | Le Conte's thrasher | None | CS | --- | Desert scrub habitats, especially associated with washes Basewide. |
| *Lanius ludovicianus* | Loggerhead shrike | None | CS | --- | Fairly common Basewide. |
| **Mammals** | | | | | |
| *Eumops perotis californicus* | California mastiff bat | None | CS | --- | In arid and semiarid lowlands; roosts in cliffs and rock crevices. |
| *Euderma maculatum* | Spotted bat | None | CS | --- | Occurs rarely and unpredictably in a number of habitats; feeds on insects, prefers moths. |
| *Plecotus townsendii townsendii* | Townsend's western big-eared bat | None | CS | --- | Roosts in caves, mines, buildings and other man-made structures; flies late at night feeding on insects, especially moths. |
| *Antrozus pallidus* | Pallid bat | None | CS | --- | Roosts in cliffs, crevices, mine tunnels, caves, house attics, and other man-made structures; feeds on ground by stalking flightless prey. |
| *Nyctimops macrotis* | Big free-tailed bat | None | CS | --- | Roosts in cliffs or crevices; emerges late at night to feed on insects. |
| *Nyctimops femerosaccus* | Pocketed free-tailed bat | None | CS | --- | On rocky desert cliffs and slopes; emerges at night to feed on insects. |

**Table 4-1 (Concluded).**
**Species of Interest on Edwards AFB**

| Scientific Name | Common Name | Federal Status | State Status | CNPS Status | Habitat Preference |
|---|---|---|---|---|---|
| *Spermophilus mohavensis* | Mohave ground squirrel | None | ST | --- | Found in desert scrub habitat. Populations known from north and south of Rogers Dry Lake, and the PIRA. |
| *Taxidea taxus* | American badger | None | CS | --- | Uncommon but Basewide. |

Notes: 1. Federal Status
FE – Listed as Federally endangered
FT – Listed as Federally threatened
FSS – Federal Sensitive Species (of concern by U.S. Fish and Wildlife Service or Bureau of Land Management)

2. State Status
SE – Listed as state of California endangered
ST – Listed as state of California threatened
CS – California species of special concern

3. California Native Plant Society (CNPS) Status
List 1B – Plants of very limited distribution; global populations potentially threatened
List 4 – Widespread and common - status does not warrant further consideration at this time

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# 5.0 THREATENED AND ENDANGERED SPECIES MANAGEMENT PLAN

## 5.1 INTRODUCTION

The Federal Endangered Species Act (ESA), Sikes Act, and Department of Defense Instruction (DoDI) 4715.3, *Environmental Conservation*, and AFI 32-7064, *Integrated Natural Resources Management,* mandate management of threatened and endangered species on military installations. Edwards AFB provides habitat for one permanent resident species listed under the ESA, the desert tortoise (*Gopherus agassizii*).

The primary objective of the Air Force (AF) natural resources program is to ensure continued access to land and air space required to accomplish the AF mission by maintaining these resources in a healthy condition. Natural resource management, in particular threatened and endangered species management, is critical to the mission because:

a. biodiversity conservation contributes to overall ecosystem integrity and sustainability, which in turn supports the military mission by maintaining natural landscapes for realistic military testing, training, and operations.
b. management of threatened and endangered species ensures that the Edwards AFB organizations are in compliance with environmental laws and regulations to include the ESA, the Sikes Act, DoDIs and AFIs.

As population growth and urban expansion continue in the Western Mojave Desert, agencies and conservation groups are likely to increase their focus on stewardship of resources on military lands such as Edwards AFB. The purpose of this plan is to allow fulfillment of the Edwards AFB mission while assisting in species recovery. This will be accomplished through ecosystem management, cooperation with regulatory agencies, education, compliance with Federal laws and regulations that protect species listed under the ESA, and an increased understanding of the natural resources on Base.

## 5.2 ROLES AND RESPONSIBILITIES

The Environmental Management (EM) Directorate is the Office of Primary Responsibility (OPR) for management of natural resources and threatened and endangered species on Edwards AFB. The EM is also responsible for monitoring projects and tortoise populations, consulting with the USFWS on a project-specific basis and a programmatic approach, and ensuring that Biological Opinion (BO) terms and conditions for species protection are carried out (see section 2).

The EM Directorate is responsible for ascertaining that mission-related undertakings are conducted in compliance with Federal natural resources legislation. They are responsible for seeking funding for threatened and endangered species programs, identifying programs and tasks, carrying out these tasks, interfacing with regulatory agencies, collaborating with other Edwards AFB and DoD departments, and managing contractor support efforts.

In addition to coordination with regulatory agencies, the EM Directorate works closely with all the other Edwards AFB offices to ensure compliance with the general requirements of the ESA and the specific requirements of the various biological opinions. This internal Edwards AFB coordination includes education and development of strategies for project impact minimization. Environmental Management cooperates with the 95th Security Forces Squadron to manage unauthorized Base entry that has the potential to impact Threatened and Endangered (T&E) species and habitat and illegal collection of protected species.

Edwards AFB consults with the U.S. Fish and Wildlife Service (USFWS) and collaborates with the Bureau of Land Management (BLM), California Department of Fish and Game (CDFG), California State Parks, National Park Service (NPS), U.S. Geological Service (USGS), and others via the Desert Manager's Group in managing protected species and habitats. In addition, Edwards AFB collaborates with NRCS, the Nature Conservancy, U.S. Army Corps of Engineers (USACE) and others on specific projects. This interaction promotes a regional management approach and the exchange of valuable management information. One example of this collaboration has been the transfer of funds to the BLM for the Land Tenure Adjustment Project. The intent is to consolidate Federal lands under the R-2508 airspace with the added beneficial result of improved land management of areas containing desert tortoise habitat.

The Base also participates in the West Mojave Desert Plan (WMDP), formerly the West Mojave Coordinated Management Plan (WMCMP). This effort is a regional interagency multispecies management plan to conserve biodiversity in the West Mojave Desert. The Edwards AFB INRMP provides the basis for Edwards AFB's integration with the WMDP.

The Mojave Desert Ecosystem Program (MDEP) is a regional land management initiative under Army leadership used by the DMG to manage the Mojave Desert at the ecosystem level. It encourages interaction among participating DoD installations, such as Edwards AFB, as well as with cities, counties, State and Federal agencies, and the general public. The MDEP is intended to develop improved mechanisms to manage common resources. The MDEP approach emphasizes ecosystem management through development of common data management systems and land use planning strategies.

## 5.3 APPLICABLE REGULATIONS

Federal agencies are required to conduct consultation under the Federal ESA (16 U.S. Code Section 1531-et seq.) prior to irreversible or irretrievable commitment of resources for any project that could adversely affect listed species. Formal consultation under Section 7 of the ESA is required if the Federal agency determines that its action may affect listed species. Formal consultation between the USFWS and the Federal agency concludes with the USFWS's issuance of a biological opinion stating whether or not the Federal action is likely to jeopardize the continued existence of a species (Figure 5-1). A no-jeopardy opinion may include restrictions on the amount of incidental adverse effects to listed species (take limits). A biological opinion typically includes reasonable and prudent measures, and terms and conditions that implement the reasonable and prudent measures, to minimize the potential for incidental take. A USFWS opinion that a project or action could jeopardize the continued existence of a species (jeopardy

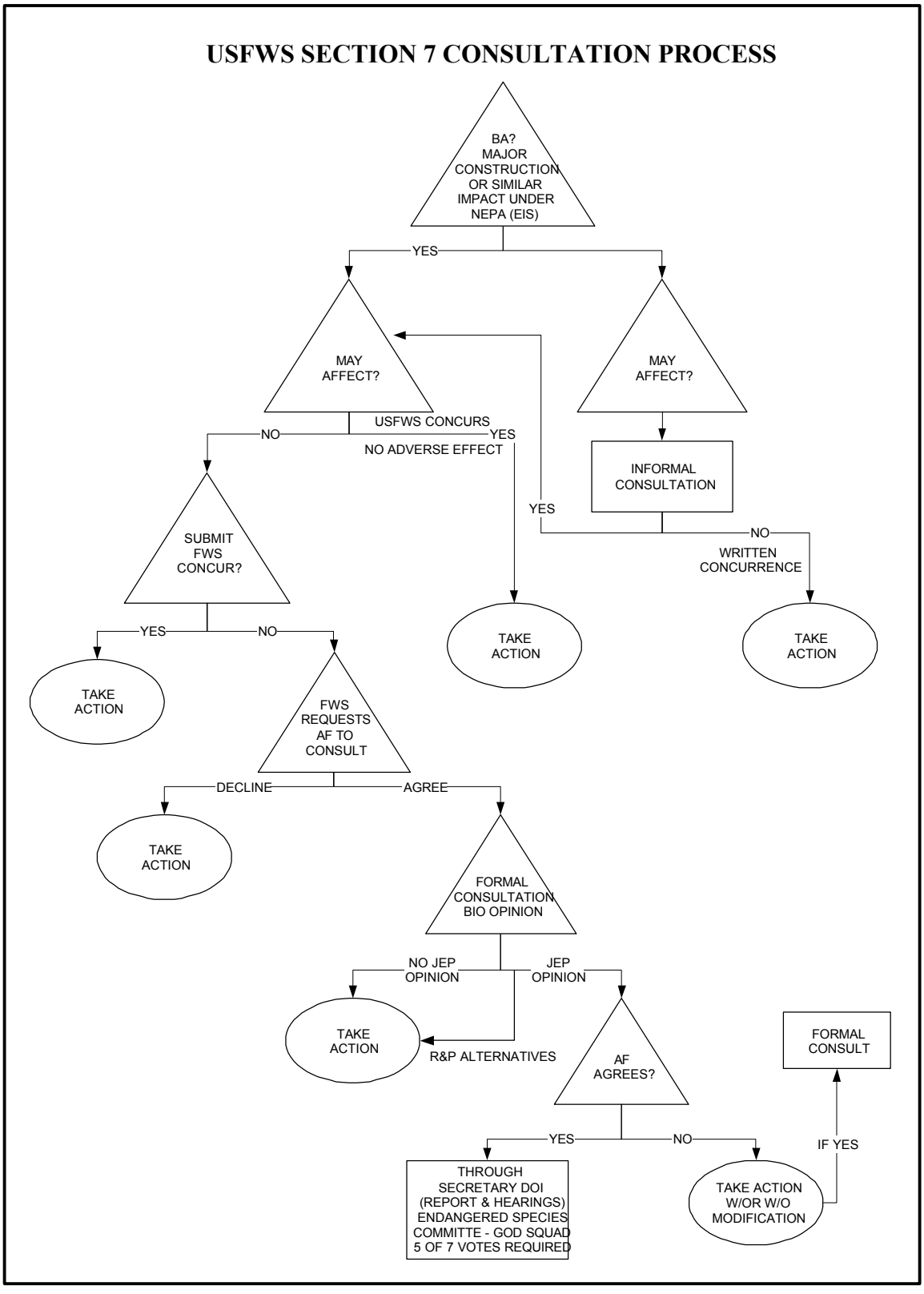



**Figure 5-1. Summary of the Consultation Process**

opinion) would also include reasonable and prudent alternatives, if any, that the Federal agency could take to avoid jeopardizing the species. If a jeopardy opinion is issued, the Federal agency must alter or cease its action to comply with Section 7(a)(2) of the ESA.

### 5.3.1 Compliance Self Assessment Program

Edwards AFB has a self-assessment program, *Environmental Compliance Assessment and Management Program* (ECAMP), Air Force Instruction 32-7045 (last updated July 1998), that outlines the program requirements. The ECAMP is intended to be a continuous process to help determine compliance with current environmental regulations through yearly evaluations. An overall ECAMP evaluation considers 13 major environmental compliance areas including Natural Resources aspects such as ESA and other issues, and also includes some overlap with occupational safety and health laws and regulations. The ECAMP is a tool designed to assist Air Force installations and organizations as they assess their compliance with various Federal, State, local, and Air Force environmental requirements. Aside from noting potential program noncompliance, ECAMP reports also identify positive findings or Best Management Practices (BMPs), which demonstrate a standard of excellence or an achievement considered best in class.

## 5.4 DESERT TORTOISE

### 5.4.1 Species Description

The desert tortoise (*Gopherus agassizii*) is a large terrestrial, herbivorous reptile found in portions of the California, Arizona, Nevada, and Utah deserts. It also occurs in Sonora and Sinaloa, Mexico. In California, desert tortoises occur primarily within creosote, shadscale, and Joshua tree series of Mojave Desert scrub, and the lower Colorado River Valley subdivision of Sonoran desert scrub. Optimal habitat has been characterized as creosote bush scrub in which precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of ephermals is high (Luckenbach 1982, Turner and Brown 1982, Turner, R.R. 1982, and Schamberger and Turner 1986). In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, with the most favorable habitat occurring between elevations of 1,000 to 3,000 feet (Luckenbach 1982, Schamberger and Turner 1986).

Under ideal conditions, the life span of the desert tortoise is 50 to 100 years or more. Once a tortoise reaches maturity, chances for long-term survival are quite good. Adult tortoises are well protected against most predators and other environmental hazards (Germano 1992; Turner *et al.* 1987). However, the mortality rate of prereproductive individuals averages 98 percent (Wilbur and Morin 1988; Turner *et al.* 1987). Desert tortoises have a long preproductive period and do not reach sexual maturity until 12 to 20 years of age. Mating occurs during the spring and in late spring or early summer (usually April to July). The female digs a small funnel-shaped nest and lays her eggs. A female may lay two to three separate clutches of 1 to 14 eggs per year. Following years of low rainfall, females may lay only a few eggs or none at all. The eggs hatch in 70 to 100 days, but the hatchlings may not appear until the following spring. Hatchlings must survive on their own because they do not receive any parental care.

Desert tortoises are most active in California during the spring and early summer when annual plants are most common. Additional activity occurs during warmer fall months and occasionally after summer rainstorms. Desert tortoises spend the remainder of the year in burrows, escaping extreme desert conditions. Further information on the range, biology, and ecology of the desert tortoise can be found in Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Luckenbach (1982), Weinstein et al. (1987), and U.S. Fish and Wildlife Service (1994a).

**Species Account.** The Mojave population of the desert tortoise is considered to be the population found north and west of the Colorado River (USFWS 1993), including parts of California, Nevada, Arizona, and Utah. In California, tortoises occupy habitat in northeastern Kern and southeastern Inyo Counties, eastern Imperial County, and most of San Bernardino and Riverside Counties (Luckenbach 1982) with a small part of Los Angeles County.

Current distribution throughout the historic range has become patchy and spotted, primarily due to habitat loss and degradation resulting from urbanization, roads and highway development, agricultural practices, recreational uses, mining, military training, and livestock grazing (USFWS 1994a). The Mojave population of the desert tortoise was listed in response to habitat loss and degradation as well as the loss of individual desert tortoises to increased predation by common ravens, disease, and collection by humans for pets or consumption.

### 5.4.2 Distribution and Abundance on Edwards AFB

The AFFTC conducted four surveys throughout Edwards AFB between 1991 and 1994 to determine relative density estimates (RDE) of the desert tortoise. With certain exceptions, the results indicate that the species occurs throughout the Base; however, desert tortoise sign (live and dead tortoises, shell and other remains, scat, and tracks) are not distributed uniformly (AFFTC 1996).

**Density Estimates.** Relative density strip transects were used to sample each USGS section (2.6 square kilometers [$km^2$]) of the installation, excluding sections within dry lakes, operational and housing areas. A total of 345 sections were sampled and 126 were excluded (Table 5-1). Each transect was sampled using BLM relative density strip transects. The type and number of tortoise sign (live and dead tortoises, burrows, scat, and tracks) within 10 meters (33 feet) of each transect centerline were recorded. Surveys were also conducted at BLM desert tortoise population trend plots with known tortoise densities in order to calibrate surveys at Edwards AFB. An adjustment was made from total sign to total corrected sign (TCS), so that multiple sign from a single tortoise was reduced to a single record. Estimated tortoise density, RDE, was calculated by multiplying TCS by an observer's calibration coefficient. This technique has been criticized for producing high estimates and is no longer recommended for use. The Edwards AFB estimates of relative density are not directly comparable with other estimates based on different sampling techniques because of these technical problems.

**Table 5-1.**
**Desert Tortoise RDE Survey Results.**

| Density Range (Tortoises/2.6 km$^2$) | Acreage | Number of Sections (2.6 km$^2$) | Percentage of Base Area |
|---|---|---|---|
| Excluded (0)*[o] | 80,640 | 126 | 27% |
| 0-5 | 13,440 | 21 | 4% |
| 6-20 | 147,200 | 230 | 49% |
| 21-50 | 55,040 | 86 | 18% |
| 51-69 | 5,120 | 8 | 2% |
| Total | 301,440 | 471 | 100% |

Notes: A total of 345 sections were sampled. The remaining 126 sections of the installation were excluded as they were within areas not supporting desert tortoise habitat (i.e., dry lakes, operational areas and housing areas). Those excluded areas were assumed to have no tortoises. Dry playa lakebeds constitute 45,728 acres. Targets encompass 1,920 acres. The remaining areas are within the Main Base and South Base cantonment areas and the developed portions of the AFRL.

*Assumed due to the lack of suitable desert tortoise habitat

Even using the TCS methodology, the tortoise densities were found to be generally low to very low throughout Edwards AFB. The Fremont-Kramer Critical Habitat Unit (CHU) densities range from 5 to 100 desert tortoises per 2.6 km$^2$ (1 square miles [mi$^2$]) (USFWS 1994a). Edwards AFB densities range from 3 to 69 tortoises per 2.6 km$^2$ (Figures 5-2 through Figure 5-4), with an average of 16.2. Approximately 80 percent of the installation has densities at or below 20 tortoises per 2.6 km$^2$. These areas are predominantly associated with the saltbush scrub plant communities. Approximately 18 percent of the Base has densities between 21 to 50 tortoises per 2.6 km$^2$. These areas are predominately located on the eastern portion of the installation within undeveloped areas; however, a few scattered pockets are within the Bissell Basin area on the western side. Tortoise densities ranging from 51 to 69 tortoises per 2.6 km$^2$ are found within the Fremont-Kramer CHU on the southeastern portion of Base, a pocket south of the city of Boron in the northern portion of the AFRL, and a pocket north of Red Hill in the Rosamond Hills. These areas account for only 1.7 percent of the installation.

### 5.4.3 Critical Habitat

On 8 February 1994, the USFWS published its final ruling on the status of the desert tortoise in the Federal Register (USFWS 1994b), designating 26,087 km$^2$ (10,072 mi$^2$) of the Designated Wildlife Management Areas (DWMA) as critical habitat for the Mojave population of this species. Designated critical habitat for the tortoise encompasses portions of the Mojave and Colorado deserts that contain the primary constituent elements that are essential to the species recovery. The boundaries were based on proposed DWMAs drawn up in the Draft Recovery Plan for the desert tortoise (USFWS 1993). Proposed DWMAs within Joshua Tree National Park (2,136.75 to 2,913.75 km$^2$) and the Desert Tortoise Natural Area (102 km$^2$) were recognized as adequately protected and therefore did not require designation as critical habitat.

In California, critical habitat totals 19,238 km$^2$ (7,428 mi$^2$) in the Imperial, Kern, Los Angeles, Riverside and San Bernardino counties (Tierra 1999). Less than 1.2 percent of the total critical

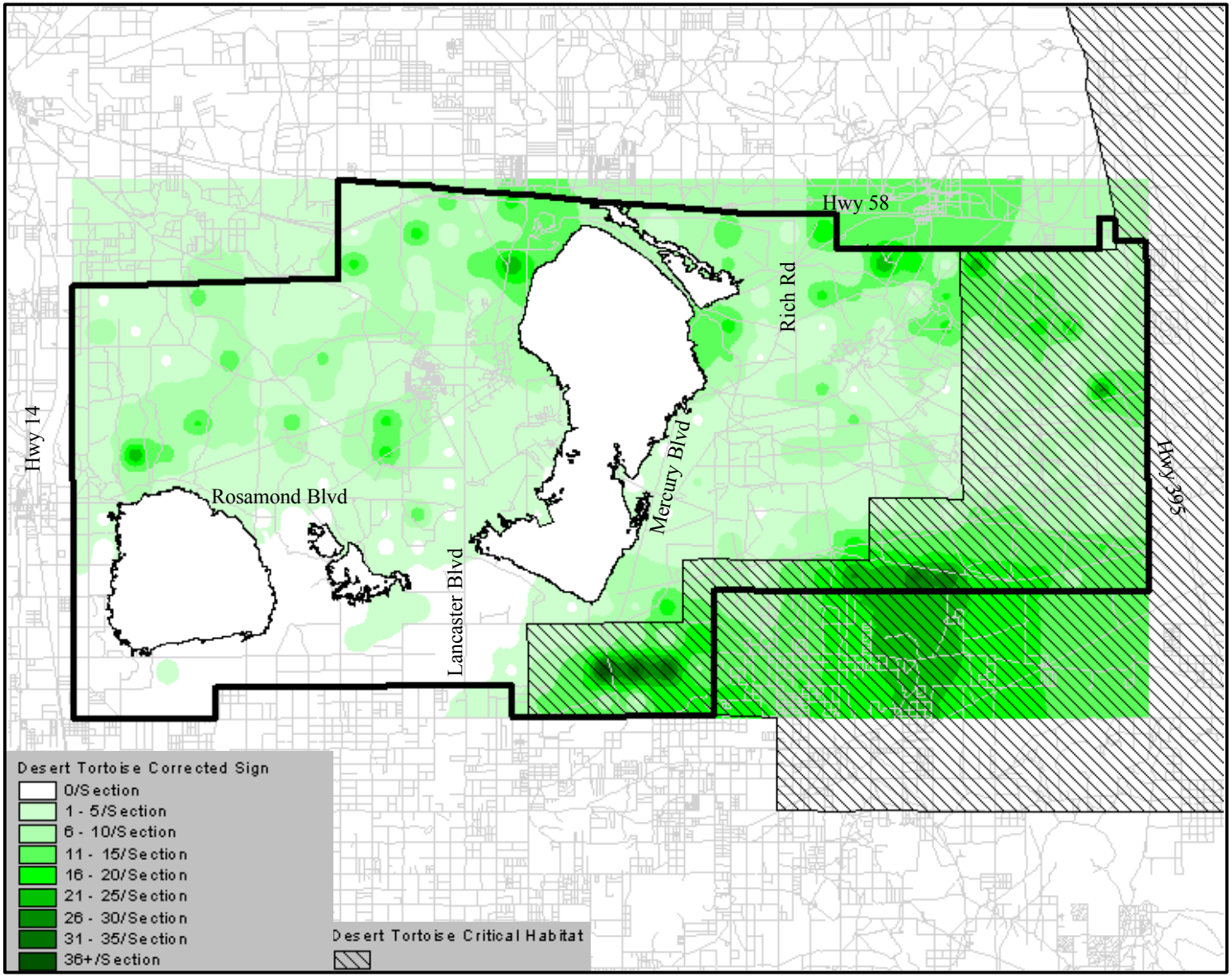



**Figure 5-2. Desert Tortoise Corrected Sign Density on Edwards AFB.**

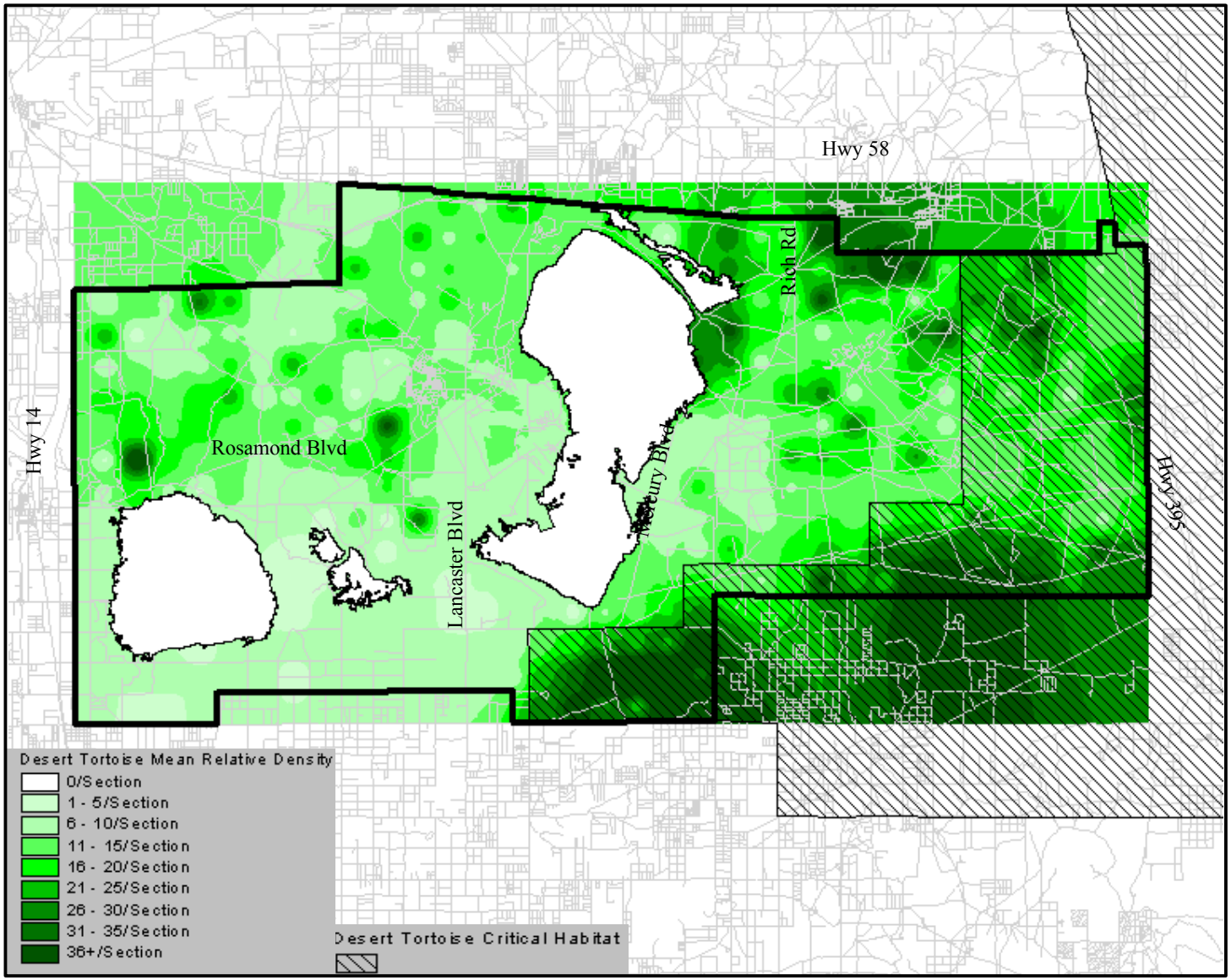
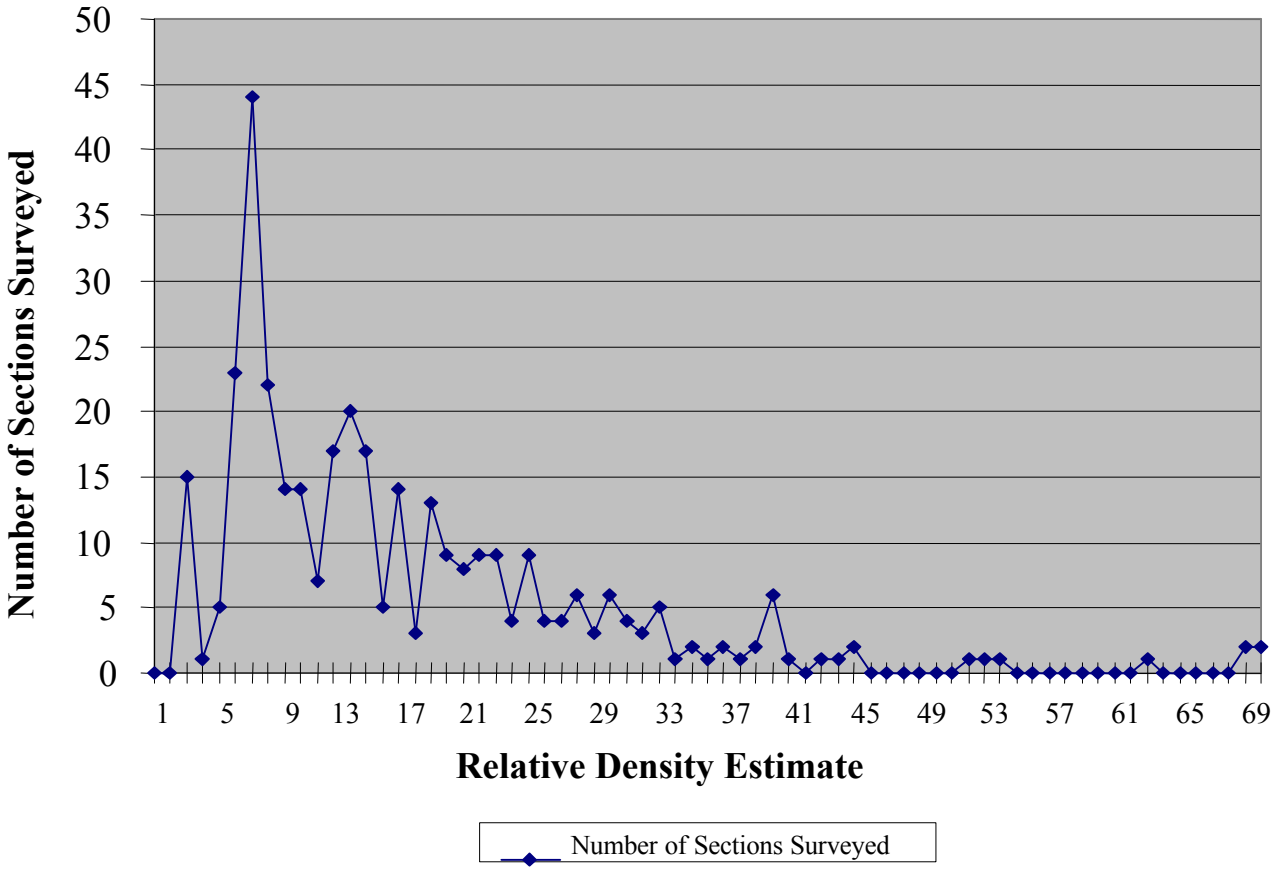



**Figure 5-3. Desert Tortoise Relative Density Estimates on Edwards AFB.**




Note: Tortoise densities are generally very low throughout Edwards AFB, with densities ranging from 3 to 69 tortoises per 2.6 $km^2$. The average density is 16.2, with approximately 80% of the installation having densities at or below 20 tortoises per 2.6 $km^2$.

**Figure 5-4. Desert Tortoise Relative Density Estimates.**

habitat designated for the desert tortoise occurs on Edwards AFB. This critical habitat is located on the eastern and southeastern portion of Edwards AFB and includes portions of the AFRL and the PIRA. Critical habitat generally consists of creosote bush scrub and Joshua tree woodland habitats, although other habitats, including xerophytic and halophytic saltbush, and mesquite woodland, are also represented. Figure 5-5 provides a regional perspective of the location and amount of critical habitat near Edwards AFB. Critical habitat has not been designated on Edwards AFB for any species other than desert tortoise.

*The Desert Tortoise Recovery Plan* (USFWS, 1994a) is the basis and key strategy for conservation, recovery, and delisting. It contains recommendations for actions needed to accomplish recovery, and land management policies (Tables 5-2 and 5-3). While the recovery plan recommendations are specifically focused on the DWMA and critical habitat areas, Edwards AFB management practices are implemented throughout tortoise habitat Basewide as appropriate for conservation of the species. The test applied by the USFWS for adverse modification of critical habitat is whether the effect of the proposed action will preclude recovery of the species in the recovery unit. It should be noted that, based on corrected sign analysis, over 250 thousand acres

of Edwards AFB have less than 10 desert tortoises (see figure 5-2) per section, which is the minimum needed (USFWS, 1994a) to contribute to the recovery of the species.

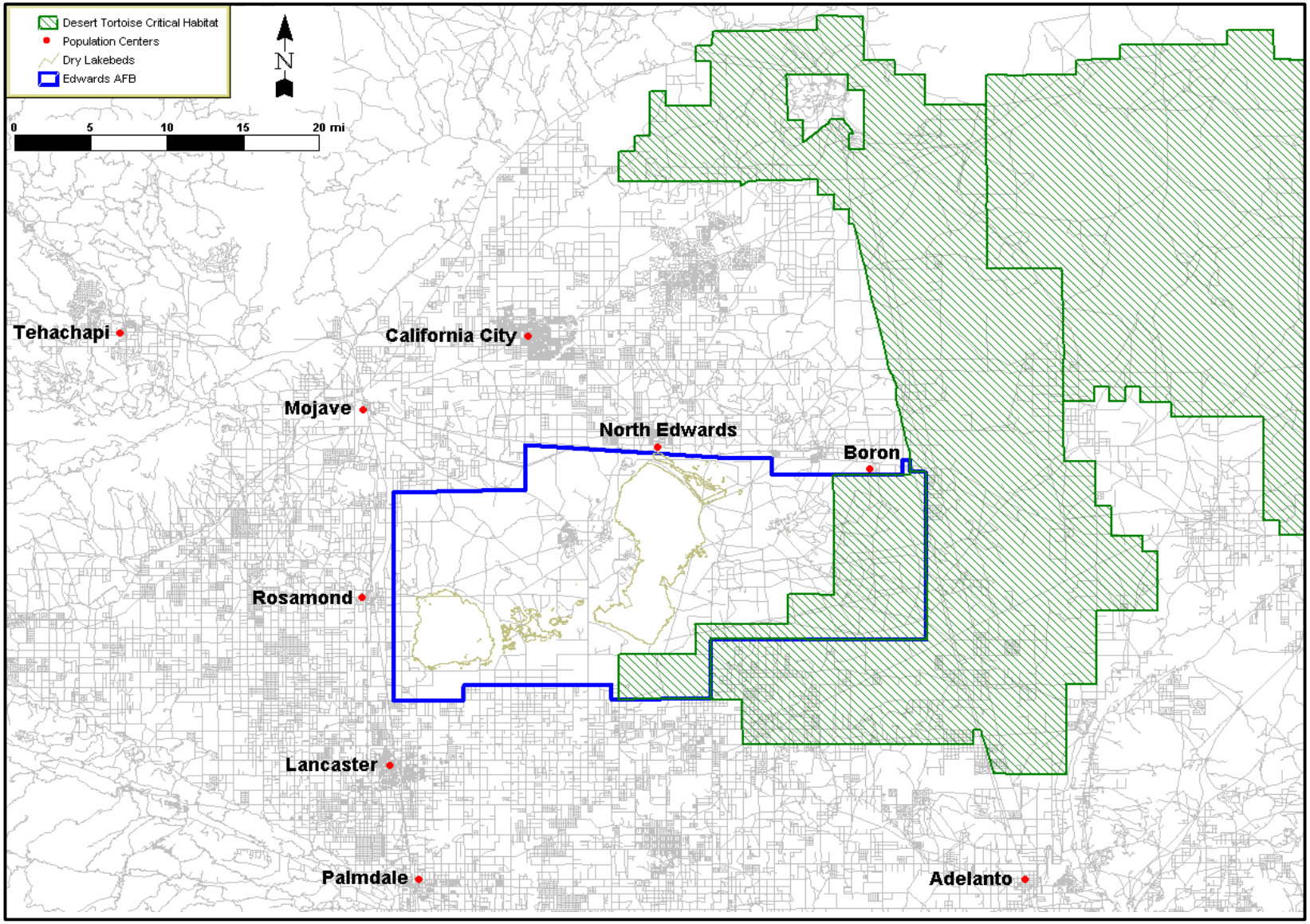



**Figure 5-5. Regional Desert Tortoise Critical Habitat.**

**Table 5-2.**
**Recommended DWMA Management Actions Found In The Desert Tortoise Recovery Plan (1994)**

| DWMA Recommended Management Actions | Current Management Actions Throughout Edwards AFB |
|---|---|
| 2a. Control vehicular access in DWMAs. | Edwards AFB is a limited access facility. The Base has controlled access points and various security measures in place. Motor vehicle traffic is limited to existing vehicle routes by Base regulations under normal circumstances. |
| 2b. Enforce regulations. | Only official government activities are allowed on Base and these projects must go through a project screening process that includes environmental reviews. The AF has both an internal and external review process for compliance with regulations that include corrective actions when necessary. |
| 2c. Restore disturbed areas. | The Base has an ongoing restoration program that is guided by the approved *Edwards AFB Revegetation Plan* (Air Force Flight Test Center 1994). |
| 2d. Sign and fence DWMAs as needed. | Edwards AFB has a signed outer boundary fence to discourage access. The fence is patrolled and maintained along with restricted access fencing in various areas. The Base has controlled access points and various security measures in place. Desert tortoise exclusion fence has been installed in locations to prevent impacts to tortoises that may enter potentially hazardous areas. |
| 2e. Implement appropriate administration. | The Base has a professionally trained staff of wildlife biologists that are authorized by the USFWS to handle desert tortoises. The professional staff provides environmental reviews of proposed projects, project surveys, and project monitoring as needed. No project is authorized to proceed without the appropriate level of environmental review. |
| 2f. Modify ongoing and planned activities. | The Base professional staff provides environmental reviews of all proposed projects and includes conservation measures as needed. No project is authorized to proceed without following these conservation measures. |
| 2g. Control use of landfills and sewage ponds by desert tortoise predators. | Edwards AFB is in compliance with biological opinions for both the landfill and wastewater treatment plant. In addition, the Base has conducted a USGS landfill raven study to track predation on desert tortoises and the impact of changes in landfill practices. |
| 2h. Establish environmental education programs and facilities. | The Base has an active desert tortoise education program. On average, there are 5 briefings given to approximately 100 individuals per month. Desert tortoise education is included in the standard Base newcomer's briefing and provided to all ground-disturbing project personnel. Specific individuals may receive advanced desert tortoise training to enable handling of tortoises under USFWS protocols. |

Notes: 1. DWMA – Desert Wildlife Management Areas
2. USFWS – United States Fish and Wildlife Service

**Table 5-3.**
**Activities Recommended for Prohibited on All DWMAS in the Desert Tortoise Recovery Plan and the Corresponding Controlled Activities on Edwards AFB**

| Activities Recommended for Prohibited Throughout All DWMAs | Activities Controlled at Edwards AFB |
|---|---|
| All vehicle activity off of designated roads; all competitive and organized events on designated roads. | Off-road activities are prohibited under normal conditions, but limited and controlled off-road use may be required in emergencies or to support specific mission requirements. The signed outer boundary fence discourages unauthorized vehicle use.<br><br>Recreational ORV activities are restricted Basewide. In the CHU, no competitive or organized events are authorized. Recreational ORV activities are confined to two delineated use areas and are in accordance with the ORV Area BO. |
| Domestic livestock grazing. | There is no authorized livestock grazing allowed on Base. The signed outer boundary fence discourages unauthorized livestock grazing. |
| Grazing by feral (wild) burros and horses. | There are no feral burros or horses on Base. |
| Vegetation harvest, except by permit. | Vegetation collections are only allowed for scientific study purposes and restoration efforts. |
| Collection of biological specimens, except by permit. | Regulated biological specimens are collected under the appropriate USFWS and CDFG permits. Other collection activities may be authorized through the Environmental Management Directorate and are approved through the NEPA process. |
| Dumping and littering. | Dumping and littering are prohibited on Base and enforced by 95 SFS through controlled access and roving patrols. |
| Deposition of captive or displaced desert tortoises or other (wild) animals, except under authorized translocation research projects. | Individuals are not authorized to release, relocate, or transport wild animals on Base without Environmental Management Directorate approval and/or appropriate agency permits. |
| Uncontrolled dogs out of vehicles. | Uncontrolled dogs are not authorized on Base. Edwards AFB maintains a full-time animal control officer and facility. |
| Discharge of firearms, except for hunting of big game or upland game birds from September through February. | Firearm use is restricted to authorized areas (including designated hunting areas and the Combat Arms Range). Use of firearms is not authorized within the CHU. These restrictions are enforced by 95 SFS. |

**Table 5-3 (Concluded).**
**Activities Recommended for Prohibited on All DWMAS in the Desert Tortoise Recovery Plan and the Corresponding Controlled Activities on Edwards AFB**

| Activities Recommended for Prohibited Throughout All DWMAs | Activities Controlled at Edwards AFB |
|---|---|
| Habitat-destructive military maneuvers, clearing for agriculture, landfills, and any other surface disturbance that diminishes the capacity of the land to support desert tortoises, other wildlife, and native vegetation | Edwards AFB has minimal mission requirement to perform ground-disturbing activities. Agricultural fields are not authorized on Base. The landfill has a BO from the USFWS. Any project that would disturb areas of native vegetation would be required to go through the NEPA process for approval. All known disturbed areas have been mapped into the GIS system and any ground-disturbing activity are placed in previously disturbed areas to the greatest extent possible while supporting mission requirements. |

Notes:
1. DWMA – Desert Wildlife Management Area
2. ORV – Off-Road Vehicle
3. CHU – Critical Habitat Unit
4. BO – Biological Opinion
5. USFWS – United States Fish and Wildlife Service
6. CDFG – California Department of Fish and Game
7. NEPA – National Environmental Protection Act
8. SFS – Security Forces Squadron
9. GIS – Geographic Information System

## 5.5 IMPLEMENTATION

Management of threatened and endangered species at Edwards AFB is based on compliance with measures contained in the ESA, Sikes Act, and the terms and conditions of the various biological opinions issued by the USFWS, including undertaking the measures necessary to minimize incidental take of desert tortoise. Appendix B lists the Biological Opinions (BO) received for activities on Edwards AFB. As a result of these thorough project coordination efforts, there has been only one documented direct mortality in the last 10 years for all the activities documented at Edwards AFB. A comparison of the general Basewide conservation measures and USFWS guidelines can be found in tables 5-2 and 5-3.

### 5.5.1 Standard Basewide Minimization Measures

These measures are proposed terms and conditions for the Base BO and may be superceded by the terms and conditions contained in the BO issued following the completion of the programmatic section 7 consultation.

a. All Base personnel (including contractors, civilian and military employees) shall be briefed by a qualified individual. The briefing shall include, at a minimum, a description of the desert tortoise, its status and measures to minimize impacts. The briefing may include the use of a multimedia presentation (videotape and printed material).

b. To the maximum extent practicable, activities must be sited to avoid effects to desert tortoises, their burrows, and habitat.

c. Where deemed necessary, preactivity surveys must be undertaken in project areas.

d. Where deemed essential, areas must be fenced, flagged, or marked to define the limit of project activities.

e. Vehicles must generally remain on previously established roads, when off-road driving cannot be avoided, operators must avoid vegetation and not exceed 25 miles per hour. All personnel shall inspect under vehicles prior to operating them.

f. Open excavations, with steep or no slope, must be checked three times a day and a qualified individual must remove any trapped animals. Open excavations must be covered, backfilled, or fenced at the end of each workday. All open excavations that are left unattended must be fenced, unless other methods of excluding desert tortoises are employed.

g. Laydown, parking, and staging areas must be restricted to previously disturbed areas as much as possible.

h. Where critical habitat is lost, the loss shall be tracked to provide a basis for possible future revegetation and restoration efforts. Noncritical habitat loss will also be recorded.

i. All trash and food items must be promptly contained and regularly removed from project sites to reduce the incidence of common raven (*Corvus corax*).

j. Project activities between dusk and dawn must be confined to areas free of vegetation and cleared of tortoises by a qualified individual.

k. Personnel authorized by the USFWS (in an opinion or via other correspondence) or Base designated individuals who have had desert tortoise handling training are permitted to handle any desert tortoises that may be found during construction and maintenance activities. The authorized personnel shall follow guidelines in *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994).

l. An annual report shall be submitted to the USFWS summarizing any incidental take, critical habitat loss and restoration.

### 5.5.2 Project Guidelines for Routine and Recurring Projects

Project planning emphasizes maximum reuse of facilities and siting within previously disturbed areas to minimize loss of desert tortoise habitat. Projects are screened to determine the management practices necessary to insure the protection of desert tortoises and critical habitat. The habitats have been divided into four areas of known habitat characteristics and desert tortoise density. Routine and recurring projects smaller than 1 acre must follow these general guidelines unless superceded by a specific biological opinion.

#### 5.5.2.1 Level 0 Areas

Level 0 areas are areas with a corrected sign of 0, known disturbed habitat with little or no native vegetation (to include excluded areas and urbanized areas in Main and South Base). Burrows and desert tortoise are unlikely to be found in Level 0 Areas. The majority of ground-disturbing activities at Edwards AFB occurs in Level 0 areas.

**Level 0 Area Guidelines:**

a. Basic Desert Tortoise Education Awareness briefing is required. The briefing shall include, at a minimum, a description of the desert tortoise, its status and measures to minimize impacts. The briefing may include the use of a multimedia presentation (videotape and printed material).

b. If a desert tortoise is observed at any time within the area of potential effect, the on-site project supervisor, or his designated representative, will avoid the desert tortoise to the maximum extent feasible and stop project activities that pose a potential harm to the desert tortoise, and will immediately notify the Environmental Management Directorate.

c. Projects must have an approved project NEPA document.

#### 5.5.2.2 Level 1 Areas

Level 1 areas are areas with a corrected sign of 1 to 10, disturbed and relatively undisturbed areas that historically have not supported high numbers of desert tortoise populations. Burrows and desert tortoise are rarely found in Level 1 Areas.

**Level 1 Guidelines:**

a. Basic Desert Tortoise Education Awareness briefing is required.

b. The project site must be presurveyed by a qualified individual to determine the presence or absence of desert tortoises on the project site.

c. Burrows that cannot be avoided will be hand excavated and any desert tortoises found will be moved out of the project site by a qualified individual, following approved USFWS protocol.

d. Site cleared daily (for desert tortoises) by trained on-site project supervisor or his designated representative before any activities. If a desert tortoise is observed at any time within the area of potential effect, the on-site project supervisor, or his designated representative, will avoid the Desert Tortoise to the maximum extent feasible and stop project activities that pose a potential harm to desert tortoise, and will immediately notify the Environmental Management Directorate.

e. Only a qualified biologist or designated individuals (who have had desert tortoise handling training) may move a desert tortoise a short distance out of harms way. The number and location of desert tortoises moved will be reported to the Environmental Management Directorate within 24 hours.

f. Projects must have an approved project NEPA document.

#### 5.5.2.3 Level 2 Areas

Level 2 areas are areas with a corrected sign of 11 to 20, a mix of disturbed areas that were only lightly disturbed or have partially recovered and undisturbed areas. Burrows and desert tortoise may occasionally be found in Level 2 Areas.

**Level 2 Guidelines:**

a. Project specific Desert Tortoise Education briefing required.

b. The project site must be presurveyed by a qualified individual to determine the presence or absence of desert tortoises in the project site.

c. Burrows that cannot be avoided will be hand excavated and any desert tortoises found will be moved out of the project site by a qualified individual, following approved USFWS protocol.

d. Site spot-checked and monitored as needed by a qualified individual. Projects that take place during periods of desert tortoise inactivity, or in areas not deemed as habitat do not need a monitor.

e. Site cleared daily (for desert tortoises) by trained on-site project supervisor or his designated representative before any activities. If a desert tortoise is observed at any time within the area of potential effect the on-site supervisor or his designated representative will stop all activities in the project area and immediately notify the Environmental Management Directorate.

f. Only a qualified biologist or designated individuals (who have had desert tortoise handling training) may move a desert tortoise a short distance out of harms way. The number and location of desert tortoises moved will be reported to the Environmental Management Directorate within 24 hours.

g. Projects must have an approved project NEPA document.

#### 5.5.2.4 Level 3 Areas

Level 3 areas are areas with a corrected sign of 21 or greater, including all of the designated critical habitats on Base. Burrows and desert tortoise may commonly be found in Level 3 Areas.

**Level 3 Guidelines:**

a. Project specific Desert Tortoise Education briefing required and regular tailgate trainings throughout the course of the project.

b. Projects shall have concurrence from the Environmental Management Directorate that there is no other reasonable alternative location for the project.

c. To the maximum extent possible, the projects will be sited in previously disturbed areas.

d. The site must have a 100-percent presurvey by a qualified individual for desert tortoises, following approved USFWS protocol.

e. Burrows that cannot be avoided will be hand excavated and any desert tortoises found will be moved out of the project site by a qualified individual, following approved USFWS protocol.

f. The project site will be monitored as needed by a qualified individual. Projects that take place during periods of desert tortoise inactivity may not need a monitor.

g. Site cleared daily (for desert tortoises) by a qualified individual, on-site project supervisor or his designated representative (who has had desert tortoise handling training) before any activities occur. If a desert tortoise is observed within the area of potential effect and a qualified biologist is not on-site, the on-site supervisor or his designated representative (who has had desert tortoise handling training) is authorized to move the desert tortoise a short distance out of harms way. The number and location of desert tortoises moved will be reported to the Environmental Management Directorate within 24 hours.

h. Projects must have an approved project NEPA document.

### 5.5.3 Project Mitigation/Minimization

Following project implementation, appropriate mitigation/minimization measures must be undertaken to comply with the biological opinion terms and conditions. These measures may include restoration and enhancement of disturbed habitat. To ensure successful restoration and revegetation, Environmental Management Directorate has prepared an *Edwards Air Force Base Revegetation Plan* (AFFTC 1994c) that complies with the *Desert Tortoise (Mojave Population) Recovery Plan* (USFWS 1994a). It recommends procedures for restoring topography, soils, and native vegetation to predisturbance conditions. The Base has also installed exclusion fences in hazardous areas that may pose potential impacts to tortoises. A perimeter fence has been installed around the Base to conserve tortoise habitat, in particular critical habitat. In addition, approximately 150 pitfalls have been closed and the closure of unused roadways in areas with high tortoise density is planned for implementation.

The AFFTC monitors desert tortoise populations using data collected by researchers and consultants conducting studies or monitoring projects on Edwards AFB. These data are used to update files and Geographic Information System (GIS) databases in order to facilitate management of desert tortoises on Edwards AFB. The data have been instrumental to the formulation of threatened and endangered species management strategy Basewide and for specific projects. The last Basewide inventory for desert tortoise was completed in 1996 (AFFTC 1996) Field efforts to reinventory the Base using the new line distance sampling methodology have been completed on Edwards AFB and the raw data is currently being analyzed.

The Basewide tortoise management program, developed to comply with biological opinions or the requirements of activities within designated critical habitat for desert tortoise, included preparation of the *Edwards Air Force Base Revegetation Plan* (AFFTC 1994c) and implementation of a desert tortoise awareness education program, with supporting videographic material. The Environmental Management Directorate has implemented numerous project surveys for desert tortoise and other sensitive species throughout the Base. These surveys have contributed substantial amounts of information on species density and distribution.

Although the Environmental Management Directorate will continue to provide guidance and seek regulatory concurrence of project activities under the ESA, ultimately, Edwards AFB is seeking

to manage threatened and endangered species Basewide with an approved programmatic approach.

### 5.5.4 Long-Term Ecological Trend Monitoring

The protection and restoration of desert tortoise populations and habitat is a continuous process. One key component of this process is the ability to check progress against established benchmarks and use this information to develop an effective management strategy. Protection and restoration efforts often do not have immediate, observable results, especially in the desert. These efforts require a monitoring program to provide feedback to ensure installation goals are reached.

A functional monitoring program needs to be directed at answering specific questions to keep the program focused and the costs reasonable. As part of the habitat quality analysis (Mitchell, et al. 1993) conducted on Edwards AFB in 1992 and 1993, 60 long-term monitoring plots were established. These plots (Figure 5-6) provide the benchmarks to evaluate environmental change. Long-term monitoring is a fundamental aspect of adaptive management and efforts are underway to evaluate and determine the appropriate indicator species (the species whose abundance determines the overall heath of the ecosystem) that will allow a focused and cost effective monitoring program.

## 5.6 IMPLEMENTATION

**Management Vision.** Overarching management vision for desert tortoise and desert tortoise habitat on Edwards AFB are twofold. First is to fulfill the mission while maintaining and enhancing natural resources on Base through ecosystem management and increased understanding of on-Base natural resources. Second is to participate in the conservation and recovery of threatened and endangered species. Past and current management of threatened and endangered species on Edwards AFB also focused on achieving this vision.

Several threatened and endangered species programs and activities are scheduled for implementation in the next 5 years. Many are long-term natural resource-related activities that have already been initiated. Other projects will be implemented based on availability of funds.

### 5.6.1 Management Goals and Objectives

The Environmental Management Directorate intensely manages activities on Base that may impact listed species, specifically desert tortoise. Management activities include habitat conservation, monitoring, focused surveys and studies, and analysis of impacts under NEPA, as approved, and subject to appropriation by Congress. The desert tortoise educational program has also proven to be an effective tool that facilitates ESA compliance.

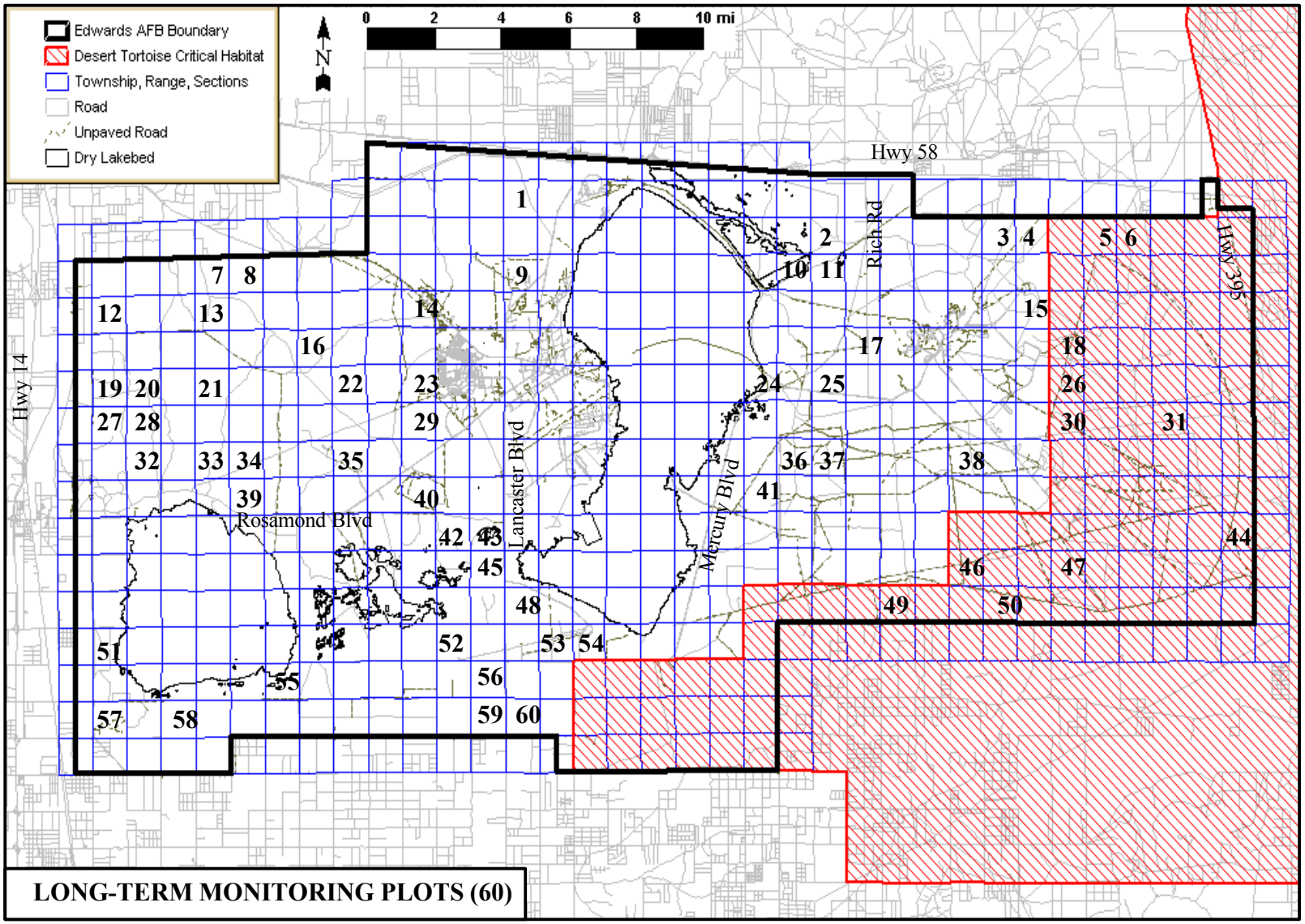



**Figure 5-6. Location of Long-Term Monitoring Plots on Edwards AFB.**

#### 5.6.1.1 Key Issues/Goals

***Habitat loss/rehabilitation, predation/direct mortality, disease, exotic species, population status data, and education.***

**Goal: Conserve desert tortoise habitat.**

**Objective 1.** Review all project activities under NEPA to minimize loss of desert tortoise habitat.

**Objective 2.** Revegetate unused/unnecessary motor vehicle routes and other disturbed areas. Continue to track any loss of habitat for future restoration/revegetation efforts and incorporate this data into the GIS layer. Priority is given to critical habitat.

**Objective 3**. Maintain limited access to desert tortoise habitat areas. Install and maintain the Base perimeter fence with a focus on critical habitat areas.

**Objective 4**. Develop a programmatic BO for routine actions on Edwards AFB.

**Goal: Maintain or increase desert tortoise population in areas that have a high potential to support desert tortoise populations.**

**Objective 1**. Support predation and mortality studies.

**Objective 2.** Develop and implement predator control plans as appropriate.

**Objective 3.** Support ongoing efforts to determine heavy-metal uptake impacts to desert tortoise populations.

**Objective 4.** Document observations of disease as required by the BO. When necessary to take a desert tortoise to the veterinarian, a sample shall be taken for a full disease screening.

**Objective 5**. Effectively manage movement patterns and desert tortoise relocation practices.

**Objective 6.** Install exclusion fencing around high-risk areas and eliminate other hazards that pose a risk to desert tortoise populations.

**Goal: Reduce impacts of exotic/pest species on the desert tortoise.**

**Objective 1.** Identify the number, location, and abundance of exotic plant species on Edwards AFB that have the potential to impact the desert tortoise.

**Objective 2.** Include actions in the Integrated Pest Management Plan for the eradication of exotic/pest species potentially impacting the desert tortoise.

**Goal: Monitor desert tortoise population.**

**Objective 1.** Survey the approximately 150 established desert tortoise transects per USFWS protocol. Conduct surveys over a maximum period of 5 years (20 percent per year) for the tenure of the recovery plan.

**Objective 2**. Based on survey results, implement adaptive management to enhance desert tortoise population.

**Objective 3**. Conduct project compliance monitoring as required.

**Goal: Promote and participate in regional planning for desert tortoise conservation.**

**Objective 1**. Participate in the Desert Manager's Group to include the Science Data Management Team.

**Objective 2**. Support the Mojave Desert Ecosystem Program to provide expanded management options and the best available technical knowledge for the management of the desert tortoise.

**Objective 3.** Participate in the development and support the initiatives of the WMDP that are consistent with the mission of Edwards AFB.

**Goal: Conduct an education and training program.**

**Objective 1.** Conduct desert tortoise program including awareness, project management, and project specific levels.

**Objective 2**. Ensure Edwards AFB professional staff receives endangered species management and technical training.

**Objective 3.** Develop, distribute, and present educational materials such as fact sheets, pamphlets, handbooks, educational displays, videos, and briefings, to educate Base personnel and the community regarding the problems, issues, and process of conserving the desert tortoise on Edwards AFB.

**Objective 4.** Continue the desert tortoise adoption program for Base employees to minimize the potential for unauthorized removal of tortoises from natural populations and releases of potentially diseased tortoises into the wild.

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# 6.0 FISH AND WILDLIFE MANAGEMENT PLAN

## 6.1 INTRODUCTION

Fish and wildlife management focuses on conserving desert habitat on Edwards AFB. Native wildlife includes a wide variety of invertebrates, reptiles, birds, and mammals adapted to the natural habitats on Base. The Base has never had a native population of fish, although fish are used to stock fishing ponds (see Outdoor Recreation Management Plan, section 11). This plan also discusses sensitive, nonlisted species, and sensitive habitats.

Natural resource management is critical to the maintenance of the Base's biodiversity. Biodiversity is important to the military mission because:

a. protection, restoration, and enhancement of biodiversity helps maintain natural landscapes for realistic military training.
b. management of natural resources helps keep the afftc and other edwards afb organizations in compliance with the ESA, DoD and Air Force Instructions, and other environmental laws. It also helps minimize the potential of nonlisted sensitive species to require further protection under the Federal ESA.

The purpose of this plan is to allow fulfillment of the AFFTC mission while ensuring maintenance and enhancement of biodiversity on Base. Our vision is to fully support the Air Force mission by establishing conditions that encourage a self-sustaining, healthy ecosystem to function naturally with the minimal amount of human interference.

## 6.2 ROLES AND RESPONSIBILITIES

The Environmental Management Directorate is responsible for the stewardship of wildlife and their habitats on Base.

## 6.3 APPLICABLE REGULATIONS

The *Sikes Act*, DoD Instruction 4715.3, *Environmental Conservation*, and AFI 32-7064, *Integrated Natural Resources Management*, require management of those species that are under consideration for listing, game species, bird/aircraft strike hazards (BASH), and overall habitat functions. In addition, the recent Executive Order 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*, 11 January 2001) has detailed requirements for migratory bird conservation.

## 6.4 PROGRAMS

### 6.4.1 Fish and Wildlife

The Environmental Management Directorate has been responsible for implementing surveys for plants and wildlife throughout the Base. A listing of studies may be found in Appendix C. These

surveys have contributed substantial information on the density and distribution of sensitive species. The data have been instrumental in formulating Base fish and wildlife and habitat management strategies. However, more detailed surveys for several taxonomic groups are still in progress. These surveys could reveal the presence of several additional sensitive species, pending determination of status for regulatory protection. Species distribution and density data may also be useful to State and Federal agencies in determination of sensitivity of species.

In addition to external coordination, the Environmental Management Directorate works closely with other AFFTC offices to ensure minimization of impacts to habitats and wildlife and to minimize the impact of wildlife on mission activities. In particular, the Base anticipates revegetating damaged desert habitats to sustain wildlife populations (including game and sensitive species), controlling bird populations to reduce BASH, developing and improving education programs, and conducting wildlife inventory programs.

Revegetation of damaged habitats on Base is intended to maintain and enhance opportunities for native wildlife (Figure 6-1). The revegetation will serve several purposes, including nonconsumptive (wildlife viewing) and consumptive (hunting) uses. Revegetation will be used to enhance habitat for protected and sensitive species and to minimize the need for regulatory agencies to seek additional protection for species on State and Federal sensitive species lists. In certain cases, development of strategies to maintain or reduce impacts to existing habitat may be critical to its protection (yardangs).

Guzzlers are another example of a routine management activity on Edwards AFB. Guzzlers are artificially developed water sources that provide water to wildlife. A guzzler is a self-contained water system, consisting of three parts: a collecting, storage, and discharge system. During periods of drought, these water sources may be critical to sustaining the wildlife populations.

A Base BASH report that includes recommendations for its control has been prepared by AFFTC (1995). The use of falcons (falconry), revegetation, and other means of controlling bird populations were included in the report. Revegetation of recently disturbed areas near the runway infields is the preferred control method and has the greatest implications to wildlife because it will modify available habitat. The intent of this revegetation is primarily to decrease horned larks, a bird species identified by the BASH Team (Kirtland AFB, New Mexico) and Edwards AFB Flight Safety Office (AFFTC/SEF) as having the highest BASH occurrence on Base. Revegetation of disturbed areas is expected to minimize the long-term availability of open foraging habitat for the species between runways and taxiways resulting in a decrease in their numbers in these areas.

The Environmental Management Directorate, in cooperation with Public Affairs and other AFFTC offices, has established and will continue to develop an education program intended to inform on- and off-Base personnel of the natural resources on Edwards AFB. Natural resources education is discussed in greater detail under the *Threatened and Endangered Species Management Plan* (section 5).

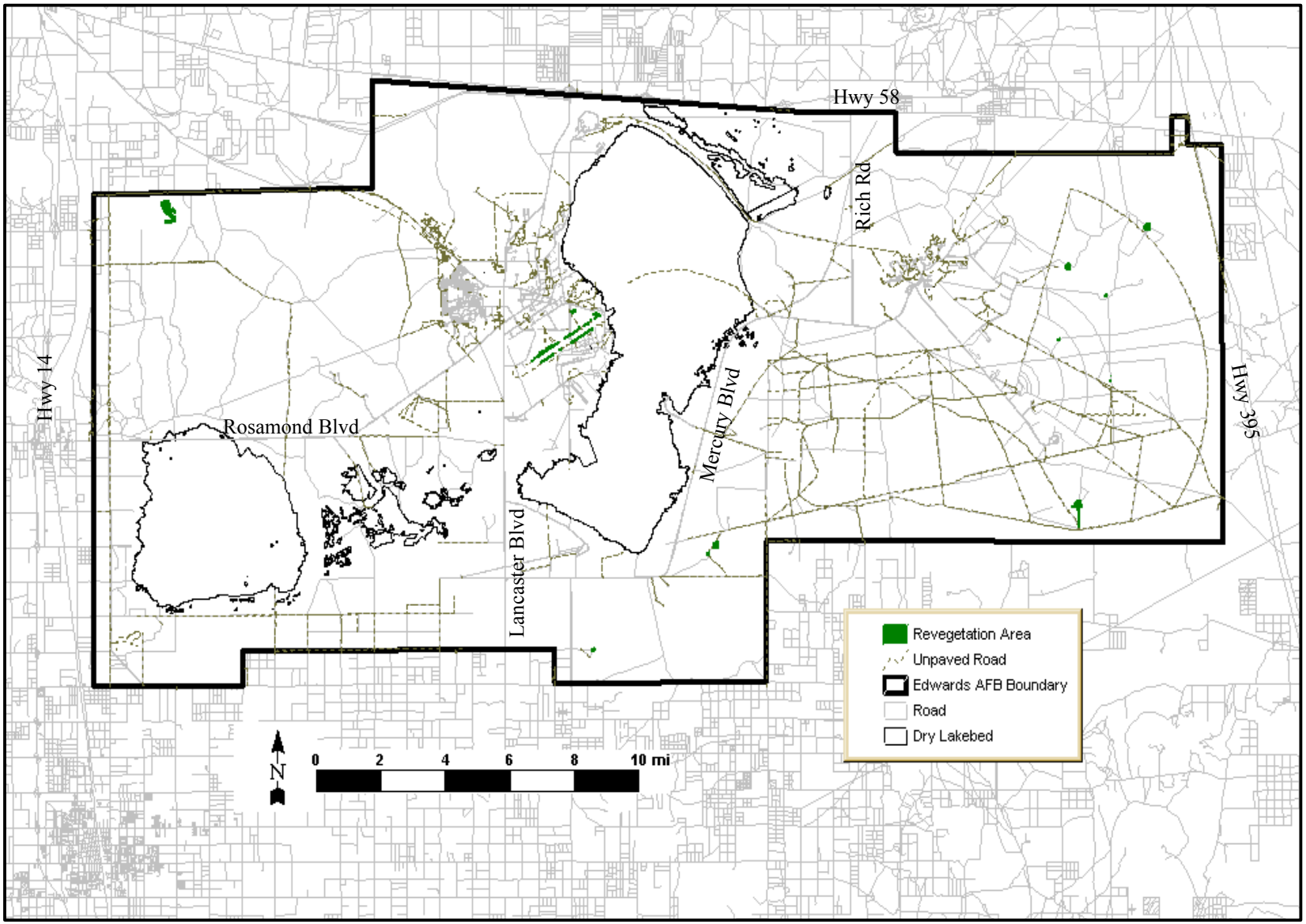


**Figure 6-1. Revegetation Project Sites on Edwards AFB.**

### 6.4.2 Sensitive Non-Federally Listed Species

The Base also manages species under consideration for listing under the State and Federal endangered species acts, as well as other species considered sensitive by various agencies. Although protection of nonlisted species is not mandatory on Federal installations, management of these species contributes to the overall maintenance of their natural populations and reduces the likelihood that these species will have to be given additional legislative protection in the future. The Mohave ground squirrel is a State listed species on Edwards AFB. The desert tortoise critical habitat and management practices required under the ESA also provide significant conservation measures for the Mohave ground squirrel because they occur in the same habitats on Base (see section 5, tables 5-2 and 5-3).

### 6.4.3 Migratory Birds

Migratory birds are protected under the *Migratory Bird Treaty Act* and Executive Order 13186 (11 Jan 2001) on migratory birds. Most native songbirds are protected by the Migratory Bird Treaty Act, which prohibits any action that directly harms native birds or their nests or eggs. Migratory birds are known to use the hydrologic areas on Edwards AFB. These areas are of special concern because hydrologic areas in the Western Mojave Desert are a very limited resource. On Base, these areas include claypans, ephemeral pools, playas, and nonjurisdictional aquatic habitat. The Executive Order directs executive departments and agencies to take specific actions to further the implementation of the *Migratory Bird Treaty Act*.

### 6.4.4 Sensitive Habitats

Most sensitive habitats on Base currently have compatible land uses that do not notably degrade these areas. In areas where mission activities are near sensitive habitats, procedures are in place to minimize the effects of an action on the habitat. These procedures include controlling the extent of activities that reduce natural habitats through appropriate exclusion. Threats to natural sensitive habitats are greater from unauthorized off-road vehicle use, now managed, in part, by fencing and security police patrols.

## 6.5 IMPLEMENTATION

The education program is a major component of the Edwards AFB program that can help limit adverse impacts and should include identifying and participating in events likely to best publicize Edwards AFB environmental management and stewardship roles; and development of audiovisual materials for a variety of audiences.

Various wildlife inventories will be updated to monitor wildlife and plant populations to verify that they remain viable. The data collected from these monitoring programs will be used to develop new management strategies, or replace existing ones. This may result in an overall cost saving, by prioritizing management of resources.

### 6.5.1 Management Goals and Objectives

The Environmental Management Directorate actively manages activities on Base that may impact sensitive nonlisted species, species under regulatory review, and birds protected under the *Migratory Bird Treaty Act*. Management activities include focused surveys, consideration of impacts to sensitive species in the EIAP, and minimization of project impacts through avoidance and/or other forms of enhancement (revegetation and habitat replacement).

Management of fish and wildlife has multiple objectives that include addressing opportunities for effective management of wildlife populations. Rather than focusing on individual species, management efforts have been and will continue to be focused on conservation, restoration, protection, and enhancement of habitats. Fish and wildlife management includes passive management such as on- and off-Base education, and active management, which includes control of nuisance species, habitat management for reduction of BASH, and desert revegetation. Fish and wildlife management practices have been and will continue to be applied to maximize and maintain fishing and hunting programs on Base (see section 1 for the public access policy).

#### 6.5.1.1 Key Issues/Goals

*Habitat loss/rehabilitation, biodiversity conservation, populations' status, migratory birds, education, exotic species.*

**Goal: Reduce habitat loss.**

**Objective 1.** Review all project activities to minimize their impacts to natural resources.

**Objective 2.** Site all projects within previously disturbed areas to the greatest extent possible.

**Objective 3.** Restore selected habitats that have been disturbed.

**Objective 4.** Review and analyze revegetation projects to determine the levels of success and the cost benefit of different restoration procedures.

**Objective 5.** Provide high quality stocks of locally adapted seed and plants to support revegetation projects.

**Goal: Conserve biodiversity on Base.**

**Objective 1.** Integrate management practices that restore and enhance wildlife and plant populations and their habitats.

**Objective 2.** Conduct baseline inventories and updates of wildlife and plant species.

**Objective 3.** Participate in regional activities to include the Desert Manager's Group and the Mojave Desert Ecosystem Program to provide expanded management options and the best available technical knowledge for the management of natural resources.

**Objective 4.** Conserve aquatic habitats to maintain ecosystem functions (to include maintenance of the lakebed surface for mission support).

**Objective 5.** Continue to promote programs that enforce conservation of natural resources on Base (to include ORV, hunting and fishing, and education).

**Goal: Monitor listed and sensitive species.**

**Objective 1.** Use long-term plots and selected sites to monitor population size and distribution.

**Objective 2.** Confer with the USFWS and CDFG on sensitive species that may be proposed for listing.

**Objective 3.** Document habitat requirements for listed and sensitive nonlisted species.

**Objective 4.** Support the intent of the migratory bird conventions (E.O. 13186).

**Objective 5.** Use inventory and monitoring data to implement an adaptive management strategy.

**Goal: Promote and provide educational opportunities for the Edwards AFB natural resources program.**

**Objective 1.** Provide information to Edwards AFB personnel and selected surrounding communities to improve the understanding of Edwards AFB's mission and natural resources stewardship efforts.

**Objective 2.** Take advantage of available technology to enhance natural resources educational outreach.

**Objective 3.** Support requests from local youth groups and schools to encourage natural resources conservation.

**Objective 4.** Support efforts to author/coauthor papers for scientific journals presenting research/project results.

**Exotic species—see Pest Management Key Issues/Goals and objectives in section 9.**

# 7.0 FORESTRY MANAGEMENT PLAN

## 7.1 INTRODUCTION

The objectives of forest management are to maintain ecological integrity, maintain a biological balance in the forest community, conserve watersheds, provide recreational opportunities and wildlife habitat, plan and coordinate the multiple use of forest lands, and to maintain biodiversity. The primary intent of the Edwards AFB Forestry Management Plan is conservation of a limited natural resource for wildlife and threatened and endangered species management, and for aesthetics. The focus is on impact avoidance through project siting and planning, discouragement of unauthorized firewood harvest, replacement of mature and unwanted tree species, removal of exotic species, and minimization of bird/aircraft strike hazards (BASH). The intent is to restore trees (and tree-like species) and woodlands, to reduce water drawdown required to irrigate nonnative trees, to maintain habitat for wildlife, including migratory birds and native game species, to conserve watersheds, and to maintain biodiversity.

## 7.2 ROLES AND RESPONSIBILITIES

The management of the forestry program for natural woodlands on Base is the responsibility of the Environmental Management Directorate. The program for urban forest management is the responsibility of Civil Engineering Group in coordination with Environmental Management and Flight Safety (regarding BASH aspects).

## 7.3 APPLICABLE REGULATIONS

The Sikes Act, DoD Instruction 4715.3, *Environmental Conservation*, and AFI 32-7064, *Integrated Natural Resources Management*, require management of woodlands, forests, and landscaping. While AFI 32-7064 focuses mostly on commercial timber harvest activities, it also contains aspects critical to watershed protection, maintenance of game species, reduction of BASH, and enhancement of habitat functions. Civil Engineering maintains a list of standards for landscaping that are also based on DoD and AFI guidance.

## 7.4 PROGRAM

Woodlands are an important and rare feature of open-desert habitats such as those on Edwards AFB. They provide nesting habitat for many bird species, many of which are protected species. Trees also provide a diversity of habitats by providing a canopy cover that creates more mesic (a moderate amount of moisture) microclimates, which provides habitat for many annual plants. Dead trees (snags) provide perches for foraging and resting raptors, while fallen trees provide shelter and food for a diverse assemblage of insects, reptiles, and small mammals.

Joshua trees are the most prominent and widespread naturally-occurring tree-like species on Base. Although scattered throughout Edwards AFB, on more mesic portions of the Base they can grow in relatively dense stands or woodlands. The Base encourages conservation of Joshua tree woodlands wherever feasible. The *Edwards Air Force Base Revegetation Plan* (AFFTC 1994c)

recommends replacement or replanting of Joshua trees and Joshua tree woodlands to maintain the diversity of natural habitats on Base.

Similarly, mesquite woodlands are a component of specific natural habitats on Base and have limited distribution (their occurrence is limited to a small portion of southcentral Edwards at a single site). Mesquite woodland is an azonal habitat found in close association with saltbush in locations where relatively deep groundwater is available. The mixed results typical of mesquite restoration efforts, and their affinity to mesic areas, make the mesquite woodlands vulnerable to degradation. Mesquite woodlands on Edwards AFB constitute a rare habitat within Los Angeles County and have been designated a SEA (SEA 47) by the County's Significant Ecological Area Task Advisory Council (SEATAC). The projected activities for the management of these areas include restoration and replacement as described in the *Edwards Air Force Base Revegetation Plan* (AFFTC 1994c).

Trees in developed areas include eucalyptus, pine, cottonwood, palm, and other species used in landscaping. The Environmental Management Directorate provides assistance for the identification and replacement of damaged urban trees with xeriscape trees throughout developed portions of the Base. The benefits of this approach are a reduction in irrigation (and a reduction in drawdown of groundwater), reduction of BASH incidence resulting from trees placed too near runways and taxiways, and a reduction in the use of pesticides or other labor-intensive efforts to maintain nonnative trees. The Environmental Management Directorate will continue to contribute recommendations for best management strategies of urban trees to reduce BASH incidence and to both manage and control wildlife in developed portions of the Base. *Landscaping Standards for Self-Help* (Edwards Air Force Base n.d.) was produced by Civil Engineering for the use of the family housing area residents and building managers in designing and developing landscaping for individual buildings on Base to ensure consistency and uniformity among individually landscaped sites.

The overall objectives and goals of the Forestry Plan are to practice best management procedures to enhance natural and urban forests on Base.

## 7.5 IMPLEMENTATION

This program consists of the rehabilitation and conservation of woodlands throughout the Base. This task will benefit, and may be undertaken concurrently with, revegetation of disturbed critical habitat to comply with the Federal ESA, the *U.S. Fish and Wildlife Service Desert Tortoise (Mojave Population) Recovery Plan* (USFWS 1994a), several programmatic BOs, and the AFI 32-7064.

### 7.5.1 Joshua Tree Woodlands

In accordance with AFI 32-7064, even forested lands that have no potential for commercial use must be managed to conserve them from fires, disease, insect attack, and to enhance other forest (woodland) resource uses (Figure 7-1). Although not considered true trees, Joshua tree

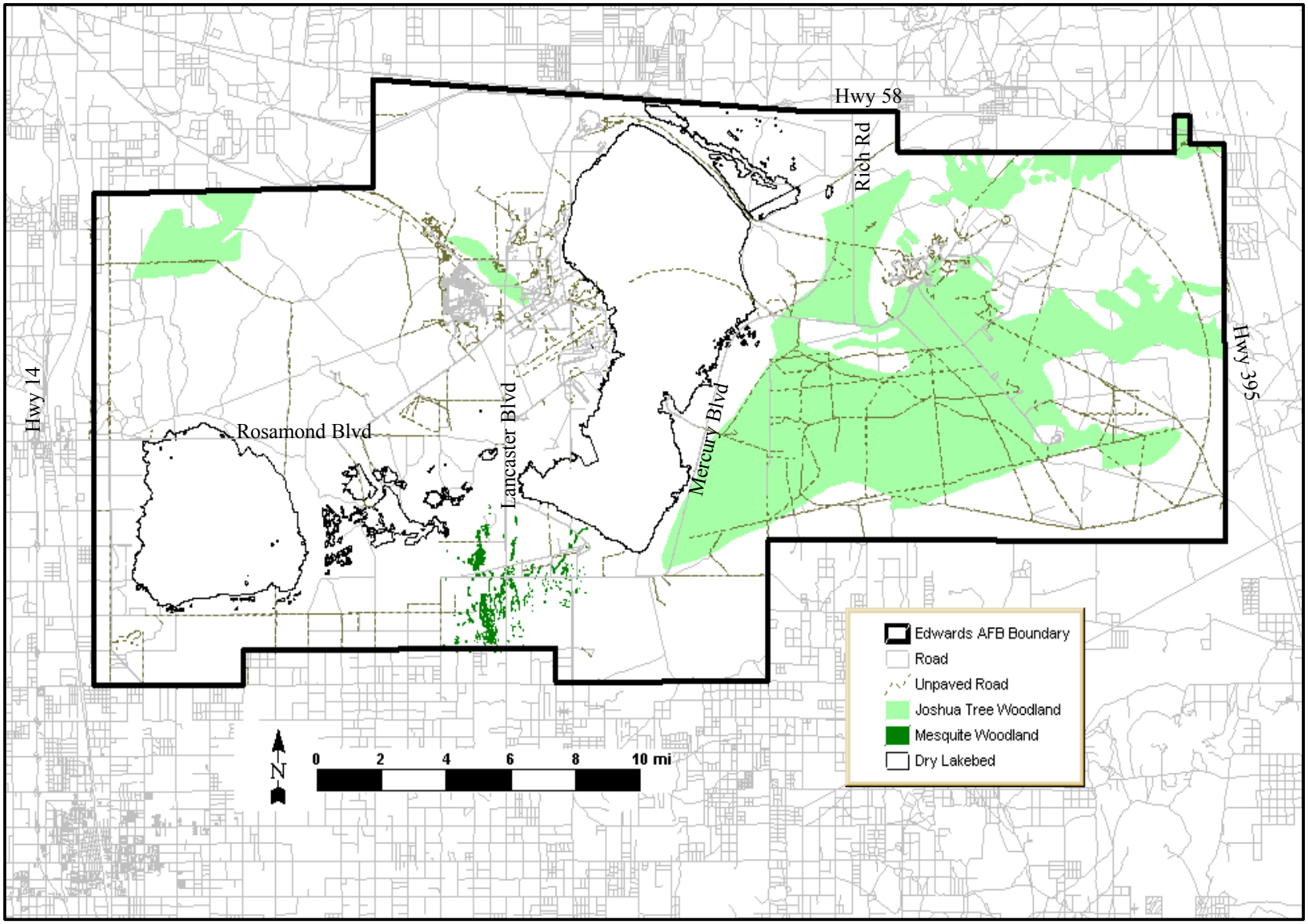


**Figure 7-1. Location of Joshua Tree and Mesquite Woodlands on Edwards AFB.**

woodlands function as woodlands in providing vertical habitat structure that supports tree-dwelling species and nesting, perching, and roosting habitat for birds (including birds of prey). Once fallen, Joshua trees provide cover for rodents and reptiles and other animals, including desert tortoises. Wherever feasible, impacts to Joshua tree woodlands will be avoided. Trees that are removed at development sites will be salvaged and transplanted, if possible. Joshua trees will also form a part of revegetation efforts for desert tortoise where these trees occur. Joshua tree restoration efforts will follow the recommendations included in the *Edwards Air Force Base Revegetation Plan* (AFFTC 1994c).

### 7.5.2 Mesquite Woodlands

Mesquites are a deep-rooted phreatophytic species. Their habitat requirements make them difficult and costly to replace. Consequently, mesquite woodland restoration efforts have a poor success rate. Projects located in areas where mesquite woodlands occur will be sited to the maximum extent possible to avoid adverse impacts to the drainages upon which they depend. Unauthorized mesquite harvesting is managed through limited access to the installation (see figure 7-1).

### 7.5.3 Key Issues/Goals

*Prevent habitat loss, exotic species control, and individual plant preservation.*

**Goal: Conserve mesquite woodlands and Joshua trees.**

**Objective 1.** Encourage in place preservation of Joshua trees where feasible.

**Objective 2.** Remove and transplant Joshua trees displaced as a result of construction or disturbance to more desirable locations when feasible.

**Objective 3.** Eradicate exotic species from mesquite woodlands and Joshua tree woodlands, especially in high-density endangered species habitat.

**Goal: Support urban forestry through xeriscaping/landscaping efforts.**

**Objective 1.** Promote xeriscape/desert-compatible species to reduce stress on water resources. Reduction of water use will benefit water-dependent woodlands by providing more available groundwater.

**Objective 2.** Consult with Civil Engineering on the planting of native tree species, shrubs, and perennial plants when landscaping the urban areas.

**Objective 3.** Identify nonnative landscape trees in urban areas and other disturbed locations that could be replaced.

**Objective 4**. Encourage/promote soil conservation through windbreak tree planting efforts.

**Objective 5.** Support initiatives to eliminate tree planting near taxiways to minimize BASH.

**Goal: Exotic species control** (see section 9.4.3).

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# 8.0 GRAZING AND CROPLAND MANAGEMENT PLAN

## 8.1 INTRODUCTION

The United States Department of Agriculture Natural Resource Conservation Service (U.S. NRCS) has prepared a Grazing and Cropland Management Plan in conjunction with a cooperative soil survey for Edwards AFB (U.S. NRCS 1996 and U.S. NRCS 1997). The plan presented recommendations for grazing and agricultural outleasing on portions of the Base, based on the presence of suitable soils and vegetation, and compatibility with mission use areas. The following sections summarize the U.S. NRCS findings.

### 8.1.1 Grazing

The U.S. NRCS identified two areas on Edwards AFB that are suitable for sheep or cattle grazing, in the northwest corner and in the southwest corner (Figure 8-1). These areas are currently used for aircraft test, training and operations, and recreational purposes. Grazing could conflict with both the mission and management for desert tortoise and game species. Grazing would reduce foraging habitat for desert tortoises, and would increase disturbance, potentially allowing more exotic species to become established that would further reduce forage. Sheep grazing can also lead to increased erosion effects. Although vegetation suitable for grazing is present in the mesquite woodlands, grazing in this area would not be compatible with forestry management goals of avoiding disturbance in order to preserve the woodlands. The mesquite woodlands area has been designated a Significant Ecological Area by Los Angeles County. Grazing is not consistent with the current AFFTC mission and the goals and objectives identified in this plan.

### 8.1.2 Agriculture

The U.S. NRCS identified four areas on Edwards AFB that have soils suitable for agricultural uses (figure 8-1). Agricultural use would reduce the foraging habitat for desert tortoises, conflict with desert tortoise habitat management and may require installation and monitoring of desert tortoise exclusion fences. Agricultural activities would increase disturbance and could result in increased pumping of groundwater on Base. Agricultural activities have historically led to a drawdown of the aquifer, and are believed to be a significant factor in the subsidence and cracking on the lakebeds. Cracks on the runways are major operation and safety issues for flight operations. There is also a concern that agricultural uses may attract nuisance animals, including desert tortoise predators, such as ravens, dogs, and coyotes. Crops could also attract large flocks of birds, adding to the BASH concerns at the Base. Crop production also would result in increased application of pesticides on Base, with possible runoff concerns and increased demands on Air Force personnel to provide oversight of pesticide applications. Further, this use of pesticides would have to be reported as part of the overall Base pesticide usage, and this new use would be difficult to reconcile with the DoD requirement of a 50-percent reduction in pesticide use.

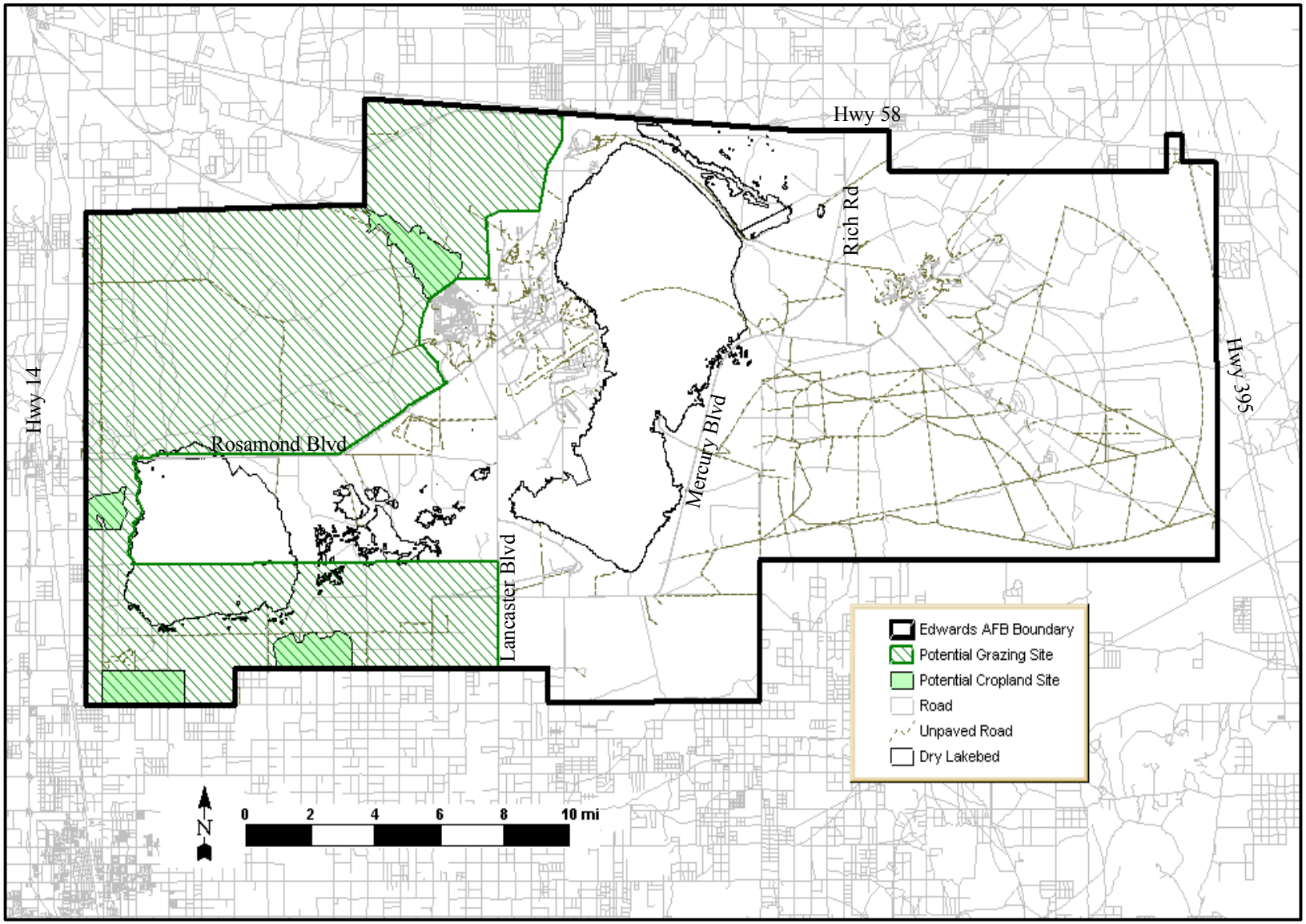


**Figure 8-1. Areas Identified on Edwards AFB That Could Potentially Support Grazing and Cropland (U.S. NRCS 1996).**

## 8.2 IMPLEMENTATION

### 8.2.1 Management Goals and Objectives

The Environmental Management Directorate actively monitors the Base for unauthorized use. Management activities include installed fencing, limited access, and enforcement of Base policies.

#### 8.2.1.1 Key Issues/Goals

*Grazing of domestic animals.*

**Goal: Prevent the unauthorized use of Edwards AFB for grazing.**

**Objective 1.** Coordinate with Civil Engineering to maintain the Base perimeter fence which discourages domestic grazing animals from entering the Base.

**Objective 2.** Monitor and report sightings of domestic grazing animals to the Base security forces.

**Goal: Restrict agriculture use on Edwards AFB.**

**Objective 1.** Review all projects and proposals via the NEPA process.

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# 9.0 PEST MANAGEMENT PLAN

## 9.1 INTRODUCTION

A narrative Pest Management Plan is required by DoD Directive (DoDD) 4150.7 for all installations that conduct more than 0.5 work-years of pest management work annually. The DoDD 4150.7 requires that on-site reviews be conducted using the guidance found in the DoDD and Armed Forces Pest Management Board (AFPMB) Technical Information Memorandum (TIM) No. 18. The TIM provides information and requirements of installation pest management programs and guidance for evaluation of these programs. This plan follows the Air Force guidance found in AFI 32-1053, *Pest Management Program*, and describes pest management program operations, management procedures, pest management facilities, health and safety issues, and regulatory compliance issues.

Integrated Pest Management (IPM) is the DoD mandated approach to pest control that utilizes routine monitoring to determine if pest control measures are necessary. Integrated Pest Management employs mechanical, physical, cultural, biological, and educational methods to maintain pests at populations low enough to prevent undesirable damage or annoyance. Application of least-toxic chemical applications is utilized as a last resort. Pest control measures are implemented only when monitoring determines that a pest will cause unacceptable economic, medical, or aesthetic damage if not treated. Treatments are chosen and scheduled to be the most effective and least disruptive to the natural environment. The IPM practices will be used at Edwards AFB whenever practicable. General IPM practices are presented in Appendix D.

## 9.2 ROLES AND RESPONSIBILITIES

The Civil Engineering Group, in cooperation with the Environmental Management Directorate and Bioenvironmental Engineering, is the Office of Primary Responsibility for pest management on Edwards AFB.

## 9.3 RELEVANT REGULATIONS

Regulations concerning the sale, application, and distribution of pesticides in California are reviewed periodically for relevancy to Base operations. The pest management supervisor maintains all applicable State, Federal, and DoD regulations that pertain to pesticides.

The *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA) (7 USC 136 et seq.) regulates the manufacture, use, storage, and disposal of chemicals used as pesticides as described in 40 Code of Federal Regulations Parts 150-180. The FIFRA is implemented in DoDD 4150.7, *Pest Management Program*.

The DoDD 4150.7, *DoD Pest Management Program,* states that it is DoD policy to establish and maintain safe, effective, and environmentally sound IPM programs to prevent or control pests and disease vectors that may adversely impact the readiness of military operations by affecting the health of personnel or damaging structures, material, or property. The directive sets the Measures of Merit (MOM) for installation pest management, annual amount of pesticide applied, and

installation pesticide applicator certification. This directive applies to all military pest control activities, including contracted operations, and is implemented by the Air Force in AFI 32-1053, *Pest Management Program*.

Air Force Instruction (AFI) 32-1053, *Pest Management Program,* provides guidance on pest management with an emphasis on avoiding impacts to the environment. This AFI discusses procedures and identifies responsibilities for pest management programs at Air Force installations. The contents of the AFI are consistent with the applicable/pertinent environmental requirements of the U.S. EPA, Occupational Safety and Health Administration (OSHA), and Air Force Occupational Safety and Health (AFOSH) standards.

## 9.4 PROGRAM OPERATIONS

### 9.4.1 Pest Management Functions

The Civil Engineering Group manages the pest control contract for inspection and control-as-necessary of household pests, structural pests, stored product pests, health-related pests, vegetation control, and aquatic pests.

Pesticide application is contracted out at Edwards AFB. Each pesticide contractor must submit a list of proposed pesticides, with AF Form 646, Material Safety Data Sheet (MSDS), and label. Edwards AFB Civil Engineering and contractors, Medical Group, and Environmental Management personnel review all lists of proposed pesticides. As applicable, Security Police, Wildlife Control Section, and Ground Safety may be consulted if activities pertaining to their area of responsibility are involved. After coordination with Edwards AFB organizations, the lists are forwarded to the HQ AFMC Entomologist for review and final approval prior to application of the pesticide. The same review and approval process applies to pest control contracts and plans.

Pesticide application at NASA DFRC is conducted under the supervision of the Facilities Management Point Of Contact (POC). The contractor applies insecticides and herbicides for prevention on a scheduled basis. Additional treatments are provided on a service request basis. Control of mammals and birds is accomplished on an as-needed basis, and must be coordinated with the Environmental Management Directorate.

Pesticides used at Edwards AFB must be registered by the U.S. EPA, approved for use as a pesticide in the state of California, and approved by the Air Force for control of target pests. Personnel applying pesticides must comply with the requirements of the Base Hazardous Materials Pharmacy and the Hazardous Communication programs.

### 9.4.2 Pest Management Programs in Developed Areas

This section presents an overview of specific Edwards AFB pests, control measures, and pesticides used in the developed areas on Base.

The DoD has established three MOM for pest management at its installations (Memorandum from the Office of the Under Secretary of the Defense, dated September 23, 1994). Measure of Merit 1 requires all DoD installations to have a Pest Management Plan prepared, reviewed, and updated annually by the end of fiscal year (FY) 1997. Measure of Merit 2 sets a goal of 50-percent reduction in the amount of pesticides used at DoD installations by FY 2000, compared to a baseline use in FY 1993. Pesticide reduction is being implemented as part of the overall pollution prevention program at Edwards AFB. Measure of Merit 3 sets a goal of having all DoD installation pesticide applicators properly certified by the end of FY 1998.

**Household Pests.** This group of pests includes cockroaches, flies, ants, crickets, spiders, and other similar organisms. These are usually nuisance pests affecting the morale of personnel; however, some can become health risks. An integrated approach of sanitation, inspection, exclusion (elimination of entry and harborage), and chemical control are used. Sanitation control measures are emphasized and chemicals are used as a last resort.

Cockroaches are the primary concern. Inspection of food-handling establishments is conducted monthly; chemical treatment is conducted as needed after sanitation and exclusion control measures have been implemented. The Medical Group must be notified prior to application of pesticides in food-handling facilities or the hospital.

**Structural Pests.** Termites are the primary structural pests at Edwards AFB. Termites can severely damage a facility and necessitate extensive repairs. Chemical control is the primary measure used for termites.

**Stored Product Pests.** These pests are not a major concern at Edwards AFB. Medical Group personnel inspect all incoming shipments of produce and meat products to ensure that the food is not contaminated.

**Health-Related Pests.** This group typically includes bees, wasps, black widow spiders, fleas, mosquitoes, and similar organisms. At Edwards AFB, health-related pests also include ground squirrels and other rodents that may carry plague, hantavirus, and other diseases that can be transmitted to humans. These pests can affect the health and well being of Base personnel. Control measures utilized for health-related pests include mechanical (traps), exclusion (elimination of entry or harborage), and chemical control.

**Developed Area Vegetation Control.** Pest control contractors accomplish all vegetation control measures on the Base, with the exception of those required for military family housing (MFH). Areas that are treated include improved grounds, Base xeriscaping, fence lines, fuel storage areas, runways, taxiways, parking ramps, and paved areas. Civil Engineering Group is responsible for pesticide application on the golf course. Efforts are made to use nonchemical pest control measures whenever reasonable. Xeriscaping is encouraged wherever feasible, using plants that are native or adaptable to the climate in the Mojave Desert, as these types of species require use of less pesticide. The MFH occupants are responsible for vegetation control in their assigned areas (i.e., midway between adjoining units or the street up to 50 feet from their dwelling).

**Aquatic Invasive Species.** The primary areas of concern are the South Base and AFRL evaporation ponds, stormwater retention ponds, and Piute Ponds. Invasive aquatic weeds are the primary concern. Mechanical means (weed whackers and mowers) are the preferred control measures.

**Bird Pests.** Flight Safety manages the bird/aircraft strike hazard (BASH) program. The control tower monitors the movements of flocks of birds on Base and alerts aircraft when there are large numbers of birds near the runway. Flight Safety maintains records of the types and numbers of birds struck by aircraft. The most common bird species involved is the horned lark, which forages in open areas. Flight Safety has coordinated with the Environmental Management Directorate to conduct inventories and behavioral studies of the birds on Base to develop measures using habitat management to discourage the birds from using the areas around the runways. Flight Safety, in conjunction with the Environmental Management Directorate, has investigated other methods of reducing numbers of birds near runways and taxiways, including controlling open water near these areas and using lighting that does not attract insects and insectivorous birds.

The BASH incidents may be controlled and reduced through a variety of methods. These include:

a. revegetation of portions of the runways and adjacent areas using plants that do not attract bird populations;
b. preventing accumulations of standing water near the runway;
c. continued use of the bird avoidance model (bam) to predict times of day, year, and locations when birds are more likely to be active;
d. mechanically securing buildings to deny access to nuisance bird populations; and
e. depredation.

Revegetation efforts are primarily targeted at reducing numbers of horned larks. Revegetation is expected to minimize the long-term availability of open foraging habitat for the species between runways and taxiways, resulting in a decrease in their numbers in these areas. The Environmental Management Directorate manages revegetation projects.

The Security Forces Wildlife Control Office is responsible for eliminating bird hazards along the flightline and in hangars, in coordination with the Environmental Management Directorate, which obtains a depredation permit for these activities. The primary method of dispersing birds is with a shotgun (startle effect); elimination of nuisance birds in hangars is also accomplished with exclusion measures. The Environmental Management Directorate has conducted evaluations using a trained falcon to discourage nuisance birds around the runway, as part of a pilot program developed by the USFWS.

Ravens are a nuisance at the Base landfill. The Base has an active recycling program to limit waste at the landfills; sanitation controls are in effect at the garbage baler building to limit the attraction for birds, and trash at the landfills is covered to eliminate access. The Environmental Management Directorate, in conjunction with USGS and USFWS, is continuing behavioral studies of ravens at landfills to better understand and devise measures for controlling these pests.

**Nuisance Animals in Developed Areas.** Nuisance animals are any wild or domestic animal pests that cause annoyance, health and safety hazard, landscape or property damage, or compromise mission objectives. These pests primarily include snakes, rodents, ground squirrels, coyotes, and other stray domestic and wild animals.

The pest management contractor is responsible for control of rodents (e.g., mice, gophers, rabbits, and ground squirrels). The preferred method of rodent control is live and kill traps. Pesticides (baits) are used only in areas of major infestation.

California ground squirrels are nuisance pests in the MFH area. An environmental assessment was prepared to evaluate the potential environmental effects of various squirrel control options, including pesticide application to sterilize or kill, traps, and no control.

Security Forces Wildlife Control is responsible for responding to domestic and wildlife nuisance animal complaints. Wildlife Control, in coordination with the Environmental Management Directorate, is permitted to relocate wildlife if necessary. Stray domestic animals are captured and taken to the animal kennel facility.

### 9.4.3 Exotic Species Management Programs in Undeveloped Areas

Exotic species are considered to be second only to habitat destruction as a factor causing depletion and extinction of native species. Some exotic species can have disastrous effects on the native flora and fauna. In their new habitat, there may be fewer predators or diseases, so their populations can grow out of control. The spread of exotic species has the potential to replace healthy, diverse ecosystems with biologically impoverished, homogeneous populations.

Exotic species comprise a relatively small proportion of the Mojave Desert flora and fauna; however, a few exotic species are invasive and can dominate, or could do so if allowed to proliferate. Most of the exotic species on Edwards AFB are plant species (see Appendix E).

**Control and management of exotic species.** The recommended approach for the control of exotic species using adaptive management consists of the following procedures:

a. determine the desired management goal;
b. identify the prioritized species to be addressed;
c. assess the various control techniques;
d. develop and implement species-specific control plans;
e. monitor and assess the impacts of the control actions; and
f. review results of control plans for effectiveness and reevaluate goals.

## 9.5 PROGRAM MANAGEMENT

### 9.5.1 Program Budgeting

Civil Engineering and the Environmental Management Directorate request funds for Base pest management contract activities; some other organizations provide funding for pesticide applications under their own budgets.

### 9.5.2 Training and Certification

Department of Defense policy requires that all DoD pesticide applicators be DoD certified. State certification does not replace DoD certification. Edwards AFB pest management personnel do not apply pesticides, but provide oversight and monitor the contractors who apply pesticides on Base property. The pest management supervisor is DoD certified. Annual Hazardous Communication and Hygiene Survey training is recorded in personnel files. Recertification is scheduled well ahead of expiration dates to ensure that certification is retained. Contractor personnel applying pesticides must have a State certification and license.

### 9.5.3 New Construction

Pest control required as part of any construction project or contract must be coordinated with Civil Engineering for scheduling and monitoring of the pest management contractor. Any new construction should conform to all applicable laws. Contractor shall report daily all types of pesticides applied, unit of measure, target pest, control operation, name of individual applying pesticide, EPA requirements, percentage concentration, amount, and location where applied by completing DD Form 1532-1, and shall provide a copy to the Contracting Officer.

### 9.5.4 Self-Help Program

The Air Force Self-Help Pest Management Program is for use by military families living on Base. The Edwards AFB self-help store does not currently stock pesticides, but can be made available by special order.

## 9.6 PEST MANAGEMENT FACILITIES

**Pest Management Shop.** The Civil Engineering pest management office is located in Building 3500. This office is for management and administration only.

## 9.7 HEALTH AND SAFETY

**Medical Surveillance Program.** Contractors are responsible for maintaining medical surveillance.

**Respiratory Protection and Personal Safety.** Contractors are responsible for respiratory protection and personal safety.

**Spill Prevention and Notification.** In the event of a pesticide spill, regardless of the amount, the contractor shall call 911 in accordance with the procedures outlined in the Edwards AFB Spill Prevention and Response Plan. Buildings where household pesticides are stored (Commissary and Base Exchange) are addressed in the Base spill prevention and response plan.

## 9.8 COMPLIANCE AND ENFORCEMENT

Pest management project requests are reviewed using the same procedures outlined in Section 2.2.1. There are, however, several specific requirements related to pest management issues.

### 9.8.1 Permits and Agreements

All contractor personnel must possess a California agricultural pest control license for Categories A (residential, industrial, institutional), B (landscape maintenance), C (right-of-way), and D (plant agriculture); as well as a California Branch 2 (general pest-structural) and Branch 3 (termite-structural) pest control operator's license. The contractor obtains any applicable State permits for work to be conducted.

### 9.8.2 Recycling and Disposal

No cleaning of pesticide-contaminated equipment or disposal of pesticide-contaminated waste is conducted on Edwards AFB. Empty containers must be disposed of in accordance with the Resource Conservation Recovery Act (RCRA 1976 et seq.).

### 9.8.3 Record Keeping and Reporting

In accordance with AFI 32-1053, the pest management supervisor is required to keep records of daily pesticide use. Because a pest management contractor applies all pesticides, the contract includes a requirement for reporting daily pesticide use. The contractor must record daily pesticide use on DD Form 1532, Pest Management Report, and 1532-1, Pest Management Maintenance Record. Information provided includes the area treated, target pest, control operation, U.S. EPA registration number of the product used, the amount of product used, and the amount of active ingredient used. Civil Engineering compiles monthly usage reports.

Edwards AFB DoD certified pest management personnel are provided DD Form 1826, Certificate of Competency, and a DD Form 1826-1, Pesticide Applicator, which are valid for 3 years from the certification date, unless revoked. Quarterly reports of pesticide applicator certification and amounts of pesticides applied on Edwards AFB are forwarded to HQ AFMC, Civil Engineering (CEVC).

## 9.9 IMPLEMENTATION

The IPM program is a major component of the Edwards AFB natural resource management program that can help limit adverse impacts from pests and exotic species.

### 9.9.1 Key Issues/Goals

*General pest and exotic species control, and biodiversity conservation.*

**Goal: Control pests and exotic species.**

**Objective 1.** Comply with all Federal, State, and local laws and regulations pertaining to pest management and pesticide use, to include ensuring contractor personnel are State-certified applicators.

**Objective 2.** Inventory and map the distribution and abundance of nonnative, invasive species (*e.g.*, *Tamarix ramosissima, and Salsola tragus*).

**Objective 3.** Develop species-specific management plans for priority species.

**Objective 4.** Review and evaluate plans and make adaptive management adjustments.

**Goal: Implement IPM.**

**Objective 1.** Maximize safety and minimize pesticide use and potential hazards to humans, wildlife and their environments.

**Objective 2.** Annually review the Pest Management Plan and incorporate updates into the plan on a 5-year cycle.

**Goal: Biodiversity conservation.**

**Objectives 1.** Prevent the introduction of noxious plant and animal species to the Base to the greatest extent possible.

**Objective 2.** Prioritize sensitive areas that require invasive plant management.

**Objective 3.** Eradicate priority exotic species.

**Goal: Effectively control health and safety related pest issues.**

**Objective 1.** Educate Base personnel on proper disposal of unused food items and other refuse.

**Objective 2.** Place tarpaulins over trash in vehicles that haul material to the landfill.

**Objective 3.** Cover the active area of the landfill with at least 6 inches of soil during daily operations and at the end of the day to reduce the site's attractiveness to pest species such as coyotes and ravens.

**Objective 4.** Educate Base personnel on exotic plant and animal species impacts to the environment.

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# 10.0 LAND MANAGEMENT PLAN

## 10.1 INTRODUCTION

Management of Air Force lands refers to future development and mission planning in association with other resources including the management of natural resources. This plan supports the Base General Plan through the integration of natural resources management into land use planning.

### 10.1.1 Land Classifications

Edwards AFB lands are classified and subsequently managed using three land categories: improved, semi-improved, and unimproved. Of the total area managed by the Base and Range, 95.3 percent is unimproved land. Semi-improved lands account for about 1.5 percent of the total, and improved land accounts for about 3.2 percent. Land usage details are presented in Table 10-1 (USAF 1994). The General Plan further breaks down each of these categories into more detailed subcategories. The following characterizations can be made regarding the land types:

a. Improved lands - This classification includes areas that have been developed for administration, housing, and other building projects. Vegetation on improved lands requires maintenance to ensure survival in the local arid climate. Improved lands have irregularly scheduled maintenance. This category would include clear areas around test facilities and improved runways. Weed and brush control is accomplished through the application of herbicides, as required. Insecticides are applied in and around buildings as needed.

b. Semi-improved lands – This classification includes areas that are generally located in proximity to runways, airfields, test facilities, fence lines, parking ramps, some recreational areas and relatively undeveloped areas such as open storage areas. Most semi-improved lands are not seeded with grass; those areas with grass are irrigated and mowed during growing season.

c. Unimproved lands - The majority of land at Edwards AFB is unimproved. These lands are not scheduled for mowing, irrigation, pruning, or insect control.

Natural resources issues related to land management on Edwards AFB include creating/ maintaining compatible land uses, and reducing ground disturbance and erosion (which can reduce problems of fugitive dust), and habitat destruction.

**Table 10-1.**
**Land Classifications (in Acres and Percentage) for Edwards Air Force Base.**

| ACRES | IMPROVED | SEMI-IMPROVED | UNIMPROVED |
|---|---|---|---|
| 300,800 | 9,843 (3.2%) | 4,448 (1.5%) | 286,509 (95.3%) |

## 10.2 ROLES AND RESPONSIBILITIES

Land management responsibility primarily rests with the Base planners, architects, and engineers in the Civil Engineering Group. A General Plan is being prepared for Edwards AFB, which will include this INRMP as a component plan.

The General Plan incorporates the concept of multiple use with the integrated, coordinated, and compatible use of various natural resources to derive the best benefit while perpetuating and protecting those resources. As such, the Edwards AFB General Plan provides a framework for land management on Base and describes existing and planned future land uses. In addition, it presents a series of goals and objectives that promote wise land management on Base.

The stewardship of natural resources affected by land use practices on Edwards AFB is the responsibility of the Environmental Management Directorate. Environmental Management Directorate personnel are responsible for obtaining funding, identifying and prioritizing programs and tasks, carrying out these tasks, interfacing with regulatory agencies, and collaborating with other Edwards AFB and DoD organizations.

## 10.3 RELEVANT REGULATIONS

Air Force Instruction 32-7062, *Air Force Comprehensive Planning,* provides guidance and policy directives for the Base land management and planning process. The overarching document for land management on Base is the General Plan, which identifies future development proposals to support both the mission and Base community, and presents a series of component plans identifying Base planning activities for infrastructure, architectural and landscape design, safety and contingency, and population. Air Force Instruction 32-7062 furthers the policies and goals of the NEPA and supports AFI 32-7061, *Environmental Impact Analysis*, to improve and coordinate plans, and to consider the natural, cultural, environmental, and social sciences in planning and decision making. Air Force Instruction 32-7064*, Integrated Natural Resources Management,* provides specific land use guidance as it relates to natural resources.

Air Force Instruction 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*, (July 19, 1994), provides general information on design and construction management. Civil Engineering conducts construction project planning and siting at Edwards AFB. The Center Planning and Zoning Committee considers project needs, proximity to required infrastructure support elements, any safety distance restrictions, and a myriad of other factors when siting projects.

## 10.4 COMPATIBLE USE

Land use management that includes natural resources management practices is broken into seven management areas at Edwards AFB (see Appendix A). These units are called Land Use Management Areas (LUMA). In delineating LUMAs at Edwards AFB, consideration was given to types of mission activities, both current and planned/proposed, as well as to the presence of natural habitats and resources. Management strategies have been identified for each LUMA (see

section 3) that integrate mission and support uses (recreational uses) with natural resource conservation.
As mentioned previously, the General Plan demonstrates the concept of multiple use on Base lands and divides the Base into existing and planned land uses. This allows the development of specific strategies to accomplish mission and natural resources management goals. The management areas, presented in section 3, utilize the General Plan future land uses and build upon those for specific management areas and activities within each area.

The General Plan identifies where existing facilities are and where new facilities should be located. Area Development Plans are being included in the General Plan for the developed portions of the Base that describe existing site conditions, facilities and infrastructure servicing the site, surrounding facilities, and future development. The Area Development Plan supports the General Plan by addressing and resolving localized compatible use issues.

### 10.4.1 Ground Disturbance and Erosion Management

Ground disturbance and erosion management on Edwards AFB focuses on reducing effects on water quality, vegetation, and habitats. Highly erodible soils are soils that because of their physical properties or slope are highly susceptible to wind or water erosion (U.S. NCRS 1996). Erosion resulting from ground-disturbing activities such as construction and grading is a land management issue because sediments can affect water quality, vegetation, and habitats. Disturbance can also create fugitive dust, which may impact the flying mission of the Base as well as local air quality. Minimizing ground disturbance and development in the dry lakebeds, especially Rogers Dry Lake, is particularly important in order to minimize impacts to the surface of the dry lake, which is critical for aircraft test activities. Use and maintenance of the runways and associated activities are planned and implemented to minimize impacts to the lakebed.

The Environmental Management Directorate analyzes all project impacts via the NEPA process described in section 2. Effective land use planning considers conservation of natural resources through reuse of disturbed areas and existing facilities. This approach reduces ground disturbance and erosion effects.

The Environmental Management Directorate encourages the implementation of best management practices during construction projects. These practices include the following:

a. minimizing the amount of area disturbed and the length of time barren ground is left exposed during construction activities to limit erosion;
b. utilizing general sediment and erosion controls (stabilization). this may include temporary seeding, mulching, sod stabilization, and creation of vegetative buffer strips during construction;
c. installing engineering structures to divert or store flow, or limit runoff;
d. using sediment and erosion control measures; and
e. utilizing xeriscape to minimize pesticide use, erosion, flooding, and future maintenance.

### 10.4.2 Flood and Stormwater Management

Flooding and nonjurisdictional aquatic management on Edwards AFB focuses on the ecological parameters of aquatic habitats. This includes acquiring baseline information, developing management strategies, implementing courses of action, and monitoring compliance. These habitats are rare and fragile resources in the desert where water is a limiting factor.

The Environmental Management Directorate is currently studying the long-term maintenance of aquatic habitats on Edwards AFB. This study requires the completion of detailed surveys to identify these resources. Edwards AFB is supporting an ongoing study by the USACE and USGS to identify and delineate aquatic habitats and the 100-year floodplain in a region where annual average rainfall is low and fluctuates. This information will then be used to develop, select, and prioritize management strategies for nonjurisdictional aquatic habitats (Piute Ponds) and flood prone areas in compliance with applicable regulations and instructions.

Stormwater management on Edwards AFB plays a role in conservation of the nonjurisdictional aquatic habitats. Catastrophic flooding may result in costly impacts to mission-critical infrastructure such as roadways, drop zones, and support structures. Sediment removal and maintenance and repair of dikes, levees, and dams at Piute Ponds help minimize the potential for catastrophic flooding on the southwestern portion of the Base. For example, periodic natural inundation is important to alkali mariposa lily (*Calochortus striatus*). This species may be adversely affected by diversion of natural drainage.

The issue of stormwater quality was addressed in the 1994 *Non-Point Discharge and Stormwater Management Plan* (AFFTC 1994b). This plan identified and assessed sources of stormwater pollution, listed management practices to reduce the amount of pollutants in stormwater discharges, and presented a monitoring program for stormwater management practices. The plan recommended preventive maintenance (oil/water separators and storage tanks), spill prevention and response, containment and covering for outdoor facilities, and drainage ditch maintenance, among other measures. The plan also recommended that a variety of monitoring points be established to allow for detection of pollution.

The historical and continuing pumping of groundwater, and subsequent subsidence on Rogers Dry Lake, has a potential for severe impact on mission requirements both in relation to stability of the lakebed for air and space craft landing, and in terms of reliable water supply to support Base residents and activities. The USGS continues to conduct long-term studies to investigate the extent of subsidence, monitor changes in water levels in the aquifer systems in the valley, and identify other water sources that could be developed to reduce subsidence. Edwards AFB and other agencies concerned about water resources in the valley support this ongoing work. The Antelope Valley Water Group (AVWG), which was formed in 1992, is supporting cooperative studies with the U.S. Geological Survey. Members of the AVWG include Los Angeles County Department of Public Works, Antelope Valley-East Kern (AVEK), cities of Palmdale and Lancaster, Palmdale Water District, Rosamond Community Services District, Antelope Valley United Water Purveyors, and Edwards AFB. A recent USGS study stated that management of local water resources is expected to be decided by members of the AVWG and other interested

parties on the basis of water demand projections, their best judgment, and their understanding of local conditions (USGS 1995a). A variety of USGS studies have recommended best management practices for water resources management in the Antelope Valley in general and Edwards AFB in particular.

**Land Subsidence**. The pervasive and continual pumping of the groundwater in the Antelope Valley has resulted in land subsidence and consequent land deformation. Land subsidence in the valley was first reported in 1968 after several differential leveling survey lines through Rosamond, Palmdale, and Redman were compared (USGS 1992). This sinking of the land surface results when aquifers containing fine-grained deposits (silts and clays) are dewatered and the silts and clays are compacted. On Edwards AFB, the greatest amount of subsidence from 1961 to 1989 was 3.3 feet, which occurred at the South Track Well Field at the southern end of Rogers Dry Lake. In this time period, subsidence on the east side of Rogers Dry Lake was as much as 0.9 foot and a maximum of 0.2 foot on the north shore (USGS 1992).

The effects of land subsidence on Edwards AFB were investigated by the USGS using groundwater monitoring and detailed surveys of the topography of Rogers Dry Lake (USGS 1998). Rogers Dry Lake is classified as a hard, clay-pan playa. The surface types range from small mud curls and cracked, puffy surfaces to a smooth, hard, and compact surface. Flooding of the playa and the subsequent drying of surface sediments cause variations in surface types (polygonal cracking and fissures) as water evaporates (USGS 1998).

Aquifer system compaction has also affected groundwater pumping at Edwards AFB. The permanent loss of groundwater storage capacity makes it increasingly difficult to pump equivalent amounts of water each season. Even if groundwater levels recover, when pumping resumes, levels return rapidly to the previous year's low. As groundwater levels decline, pumping costs increase because the water must be lifted greater distances (USGS 1996). Groundwater in closed basins is commonly highly mineralized because of evapotranspiration that concentrates the minerals in the water. The mineral content of the groundwater in the Antelope Valley has remained practically the same or decreased slightly between 1908 to 1955. These data are probably representative of a reduction of evapotranspiration caused by declining water levels in the principal aquifer (USGS 1995a).

## 10.5 CULTURAL RESOURCES PROTECTION

The Environmental Management Directorate is responsible for the development and implementation of all Base cultural resource activities to include the inventory and evaluation of sites eligible for protection under the *National Historic Preservation Act* (NHPA) (16 USC 470, et seq.). Within the boundaries of the Edwards AFB there are archaeological and historical sites. These will be described in the 2001 *Integrated Cultural Resources Management Plan* when published.

Cultural resources activities have the potential to impact natural resources primarily through collection of artifacts (feathers, bones and plant material) and excavation (removal of vegetation and soils) of archaeological or historic sites.

Natural resources management on Edwards AFB has little potential to affect cultural resources. Conversely, cultural resources management on the Base seldom significantly affects natural resources management. In the case of site mitigation, the natural resources staff will survey the area for desert tortoise. Upon completion of the site mitigation, the site will be restored to as close to its natural condition as possible (AFFTC 1994c).

Numerous provisions of this INRMP benefit cultural resources management at Edwards AFB. These include military personnel and civilian employee awareness, land restoration and maintenance, project program enforcement, and NEPA Implementation.

## 10.6 REGULATORY PROJECT REVIEW AND COMPLIANCE ENFORCEMENT

Land management projects are reviewed using the same procedures outlined in section 2.

## 10.7 IMPLEMENTATION

### 10.7.1 Key Issues/Goals

*Effective planning, land usage, water resources, and cultural resources impacts*

**Goal: Effectively manage land use issues.**

**Objective 1.** Use the best available information and technology in making decisions.

**Objective 2.** Implement adaptive management through a long-term monitoring program.

**Objective 3.** Support public involvement, open communication, and incorporation of public concerns into the management decision process.

**Goal: Manage for sustainability.**

**Objective 1.** Provide long-term effective and efficient use of land Base resources to support the Air Force mission.

**Objective 2.** Use the NEPA process to minimize impacts of flooding on the mission.

**Goal: Conserve aquatic resources**

**Objective 1.** Review project plans to ensure drainage patterns are not changed in areas where listed or sensitive species occur (alkali mariposa lily).

**Objective 2.** Actively manage aquatic vegetation to conserve species diversity.

**Objective 3.** Conduct baseline inventories and ecological function studies of aquatic dependent species.

**Goal: Promote water conservation and reuse.**

**Objective 1.** Develop measures through the NEPA process to encourage water conservation.

**Objective 2.** Maximize use of reclaimed water for aquatic habitats.

**Objective 3.** Study feasibility of increased use of gray water for recreational water impoundments.

**Objective 4.** Continue the use of gray water to enhance recreational opportunities.

**Goal: Integrate natural and cultural resources management practices.**

**Objective 1.** Consider natural resources when planning cultural resources projects.

**Objective 2.** Consider cultural resources when planning natural resources projects.

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# 11.0 OUTDOOR RECREATION MANAGEMENT PLAN

## 11.1 INTRODUCTION

Management of natural resources to provide opportunities for outdoor activities on Air Force lands is described in AFI 32-7064. This plan presents procedures to be used to integrate Outdoor Recreation Management information into the overall Base mission and into natural resources planning and management. Providing quality outdoor recreation experiences contributes to an enhanced quality of life for Air Force personnel and contributes to multiple uses of on-Base natural resources. Opportunities to increase and enhance recreation without impacting natural resources can be provided through effective management. One method of implementing this goal is to increase the interpretive and special interest areas for both recreational and educational purposes within the natural environment.

## 11.2 ROLES AND RESPONSIBILITIES

The Air Base Wing Commander is ultimately responsible for outdoor recreation management on Edwards AFB. The Services Division, Environmental Management Directorate, Civil Engineering Group and Security Forces, cooperatively, execute the outdoor recreation program.

## 11.3 RELEVANT REGULATIONS

Air Force Instruction 34-110, *Air Force Outdoor Recreation Programs*, provides guidance for initiating and maintaining outdoor recreation programs at Air Force installations. It outlines roles and responsibilities, safety considerations, program goals, and funding categories. A number of DoD, Federal, and State guidelines and restrictions provide policy guidance for management of specific recreational programs. State of California rules and regulations applicable to hunting and fishing are contained in the Fish and Game Code, Sections 1 to 16451. The Fish and Game Regulations (Title 14, Division 1, California Code of Regulations) contains State wildlife policies, agency responsibilities, hunting and fishing provisions, trapping provisions, licensing and permit requirements, take restrictions, and penalties for code violations.

The *Migratory Bird Treaty Act* (16 United States Code [USC] 703-712) protects all native birds from any activity that results in injury or harm to birds, their nests, eggs, or any other part or product of a bird. Hunting permits issued by the State exempt certain bird species (primarily gallinaceous birds and waterfowl) from the regulatory requirements of the *Migratory Bird Treaty Act*. Hunting migratory species other than those recognized in hunting licenses is a violation of both State and Federal law. Air Force Flight Test Center Instruction 32-8, *Management and Conservation Program for Fish and Wildlife* (December 1, 1995), the Edwards-specific regulation is currently in revision.

## 11.4 PROGRAMS

The Environmental Management Directorate, in coordination with Services, manages the Hunting and Fishing program. The remainder of the outdoor recreation program activities is managed through Services. Outdoor recreational activities on Edwards AFB include ORV use; camping;

equestrian use; ball fields; golf course; swimming; and Physical Activity Readiness (PAR) course, bicycling, jogging, and hiking trails.

The Volunteer Wildlife Conservation (VWC) Program is key in supporting the hunting and fishing program and habitat conservation programs that support game and other wildlife populations on Edwards AFB. Volunteers must pass a screening process, be trained, and provide a minimum number of hours per month of volunteer assistance to the program.

### 11.4.1 Hunting and Fishing

Air Force Flight Test Center Instruction 32-8, *Management and Conservation Program for Fish and Wildlife* (December 1, 1995), governs hunting and fishing on Edwards AFB. California Department of Fish and Game (CDFG) regulations are applied on Base unless further limited by Base rules. Information is periodically published in the AFFTC Bulletin and the Base newspaper, and is also provided through the Hunter's Hotline, Environmental Management, or Security Forces. See AFFTCI 32-8 for detailed guidance and policies specific to hunting and fishing.

The Environmental Management Directorate is responsible for consulting with the U.S. Fish and Wildlife Service and California Department of Fish and Game to ensure compliance with appropriate Federal and State laws. In addition, the Directorate is responsible for managing the funds in the Wildlife Conservation account.

Security Forces are responsible for enforcement of Federal, State, Air Force, and AFFTC instructions specific to fish and wildlife, routine law enforcement, and public safety. In addition, they coordinate enforcement activities with the Environmental Management Directorate and County, State, and Federal personnel.

Services is responsible for collecting funds generated by the Hunting and Fishing Program. These funds are transferred to the Base comptroller for deposit into the Wildlife Conservation account. Services-sponsored events in Branch Memorial Park Pond are the responsibility of Services. In addition, hunter education courses are taught through Services as part of the rod and gun program.

The Operations Group in the Test Wing is responsible for providing information to the Environmental Management Directorate on potential conflicts between hunting activities and low-altitude aircraft missions.

### 11.4.2 Outdoor Recreation

Air Force Instruction 34-110, *Air Force Outdoor Recreation Programs* (July 22, 1994), guides the development and management of outdoor recreation programs at Air Force installations. Figure 11-1 illustrates outdoor recreation areas on Base. The outdoor recreation program on Base includes off-road vehicle (ORV) areas, camping; equestrian use, ball fields, golf course operation, swimming, PAR course, bicycling, jogging, and hiking trails; and recreational and educational use of areas on Base that provide historic, botanical, ecological, geological, zoological, or scenic interest.

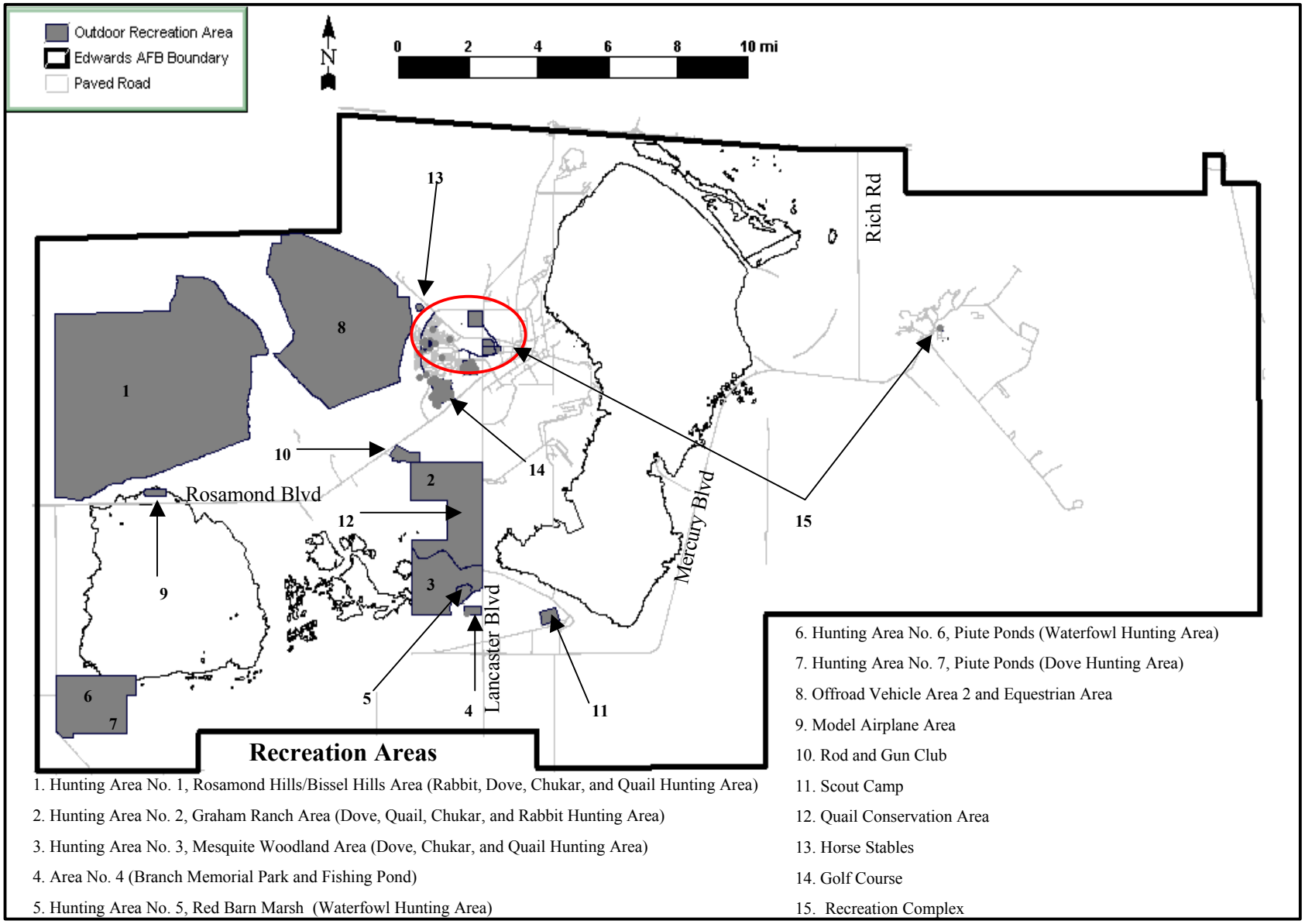


**Figure 11-1. Location of Outdoor Recreational Areas on Edwards AFB**

**Off-Road Vehicles.** The AFFTCI Supplement, *Use and Control of Off-Road Vehicles (ORV)* (September 9, 1996), serves as policy for the Base's two ORV areas (ORVA). Off-Road Vehicle Area No. 1 (approximately 100 acres in size) is for the use of the Desert Wheels Motorcycle Club only. Off-Road Vehicle Area No. 2, 15,040 acres located west of the military family housing, is jointly used for equestrian, ORV, and general recreational use. All off-road vehicles must be licensed, insured, and operated only within designated trails in ORVAs. The requirements for compliance with the ESA for these areas are described in a 1996 BO (1-8-96-F-10) (USFWS 1996). Signs are placed at least every one-half mile along the boundary to delineate the ORVAs. Bulletin boards are placed in at least two main access areas and provide rules and safety information. Security Forces patrol the areas to ensure that riders remain within the boundaries and use existing trails. Few tortoises are known to use this area (corrected sign of 0 to 20 per square mile only), and none have been reported to have been injured or to have incurred direct mortality from these activities. Edwards AFB requires all riders to carry proof of training. The Environmental Management Directorate requires all operators to receive desert tortoise awareness training.

**Camping.** Two designated camping areas are available on Base. The Family Camp Ground (Fam Camp) is for the use of active duty and retired military, DoD contractors, civilian personnel, and their dependents and guests. The Scout Camp is used for scout activities only.

**Equestrian Facilities.** Equestrian facilities including horse stables and arenas are provided for authorized users in accordance with AFI 34-110. Stall fees are established at levels that fully cover all nonappropriated fund stabling expenses. All horses must be inoculated against local diseases and a veterinarian must declare them free of infectious diseases. The Base equestrian facilities consist of 42 stables (capacity for 80 horses), an exercise and training area, and a large open riding area. Equestrian use of the ORV trails is allowed.

**Golf Course.** Air Force Instruction 34-116, *Air Force Golf Course Program*, (February 1, 1996), provides guidance and procedures for Air Force golf programs to enhance the mental and physical well being of Air Force members and their families. The 18-hole golf course and driving range at Edwards AFB is located within the MFH Area. Services and the Civil Engineering Group consult with Bioenvironmental Engineering and the Environmental Management Directorate on use and application of herbicides, pesticides, fertilizer, or other chemicals in accordance with applicable Federal, State, and local regulations.

**Other Recreation Programs.** Jogging, PAR course, hiking, and bicycle trails, swimming facilities, and a skating park are located within the Main Base and Family Housing areas. Picnicking and ball fields are also located within these areas and at designated recreational areas such as Branch Memorial Park.

Ecological recreational and education opportunities exist at Piute Ponds and other locations on Base. Access is authorized by the ABW or Support Group Commanders. These areas are patrolled by Security Forces to guard against vandalism.

## 11.5 IMPLEMENTATION

Civil Engineering has developed an Outdoor Recreational Development Plan, which will be incorporated into the General Plan. This outdoor recreation management plan will be reviewed and updated as required by the appropriate Base organizations for their respective responsibilities.

### 11.5.1 Key Issues/Goals

*Recreation.*

**Goal: Support quality of life.**

**Objective 1.** Manage outdoor recreation consistent with needs of the Edwards AFB military mission.

**Objective 2.** Integrate recreation activities with natural resources stewardship and compliance.

**Objective 3.** Control access to Edwards AFB for natural resources recreation in accordance with Edwards AFB policies.

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# 12.0 REFERENCES

AFFTC. 1993a. *Edwards Air Force Base Flood Study,* December. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1993b. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*, December. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1994a. *Botanical Resources Study of Complex 1 Charlie, Edwards Air Force Base, CA*. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1994b. *Edwards Air Force Base Non-Point Discharge and Stormwater Management Plan,* June. Document on file at Environment Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1994c. *Edwards Air Force Base Revegetation Plan,* December. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1995. *Bird Aircraft Strike Hazard Investigation at Edwards Air Force Base, California*, July.

AFFTC. 1996. *Relative Density Estimates of Desert Tortoise on Edwards Air Force Base, California*, August. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

AFFTC. 1998a. Annual Report to the *Drinking Water Program for Medium and Large Water Systems*. 95 AMDS/SGPB.

AFFTC. 1998b. *Stormwater Pollution Prevention Plan (SWPPP), Edwards Air Force Base, California,* September. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

Air Force Flight Test Center Instruction (AFFTCI)

AFFTCI 32-8. 1995. *Management and Conservation Program for Fish and Wildlife*, December.
AFFTCI 33-17. 2001. *Management of the Geographic Information System*, January.

Air Force Instruction (AFI)

AFI 32-1023. 1994. *Design and Construction Standards and Execution of Facility Construction*, 19 July.
AFI 32-1053. 1999. *Pest Management Program*, 1 April.
AFI 32-7045. 1994. *Environmental Compliance Assessment and Management Program*, 5 April.
AFI 32-7061. 1995. *The Environmental Impact Analysis Process*, 24 January.
AFI 32-7062. 1994. *Air Force Comprehensive Planning*, 18 April.

AFI 32-7064. 1994. *Integrated Natural Resources Management*, 22 July.
AFI 34-110. 1994. *Air Force Outdoor Recreation Programs,* 22 July.
AFI 34-116. 1996. *Air Force Golf Course Program*, 1 February.

Burge, B.L. 1978. *Physical Characteristics and Patterns of Utilization of Cover Sites by Gopherus agassizii in Southern Nevada*. Proceedings of the 1978 Symposium. The Desert Tortoise Council. pp. 80-111.

Burge, B. L., and W.G. Bradley. 1976. *Population Density, Structure and Feeding Habits of the Desert Tortoise (Gopherus agassizii), in a Low Desert Study Area in Southern Nevada*. Proceedings of the 1976 Symposium. The Desert Tortoise Council. pp. 51-74.

California Code of Regulations, Title 14, Division 1. *Fish and Game Commission – Department of Fish and Game.*

Charlton, D. 1992. *Plant Species of Edwards Air Force Base*. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

Code of Federal Regulations (CFR)

Title 40, Parts 150-180, regarding the use of pesticides.
Title 40, Parts 1500-1508, regarding the National Environmental Policy Act.

Department of Defense Instruction (DoDI)

4150.7. 1996. *DoD Pest Management Program.* April.
4715.3. 1996. *Environmental Conservation Program*. May.

Desert Tortoise Council. 1994. *Guidelines for Handling Desert Tortoise During Construction Projects*.

DMA Consulting Engineers. 1986. *Edwards Air Force Base Dry Lake Geomorphology and Special Flood Hazard Study*. Prepared for the U.S. Army Corps of Engineers. April.

Edwards Air Force Base. no date. *Landscaping Standards For Self-Help*.

Executive Orders (EO)

11990. 1977. *Protection of Wetlands*, 24 May.
13186. 2001. *Responsibilities of Federal Agencies to Protect Migratory Birds*, 10 January.
13112. 1999. *Invasive Species*, 3 February.

Germano, D.J. 1992. *Longevity and Age-Size Relationships of Populations of Desert Tortoises*. Copeia (2):367-374.

Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* California Department of Fish and Game. Nongame Heritage Program, Sacramento.

Hovik, D.C. and D.B. Hardenbrook. 1989. *Summer and Fall Activity and Movements of Desert Tortoises in Pahrump Valley, Nevada.* Abstract of Paper Presented at Fourteenth Annual Meeting and Symposium of the Desert Tortoise Council.

Luckenbach, R.A. 1982. *Ecology and Management of the Desert Tortoise (Gopherus agassizii) in California*. Pages 1-37 in R.B. Bury, ed., North American Tortoise and Conservation and Ecology. U.S. Dept of Interior, Fish and Wildlife Service, Wildlife Research.

Mitchell, D., K. Buescher, J. Eckert, D. Laabs, M. Allaback, S. Montgomery, and R. Arnold, Jr. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis*.

Office of the Under Secretary of the Defense. 1994. Memorandum dated September 23 regarding establishment of Measures of Merit.

Schamberger, M., and F.B. Turner. 1986. *The Application of Habitat Modeling to the Desert Tortoise (Gopherus agassizii)*. Herpetologica 42(1): 134-138.

Speaks, MSgt Frazier (95 CEG/CEOUWH). 1999. Written communication with Robert Mulcahy (Computer Sciences Corporation) regarding the transfer of AVEK water to Edwards AFB, 27 July.

Tierra Data Systems. 1999. *Biological Assessment: Effects of Training and Land Use at Marine Corps Air Ground Combat Center, Twentynine Palms, on the Desert Tortoise (Gopherus agassizii*). MCAGCC, Twentynine Palms, CA. pp. 136.

Turner, F.B., and D.E. Brown. 1982. Sonoran Desert Scrub. In: D.E. Brown (editor). *Biotic Communities of the American Southwest-United States and Mexico.* Desert Plants 4(1-4): 181-222.

Turner, F.B., K.H. Berry, D.C. Randall, and G.C. White. 1987. *Population Ecology of the Desert Tortoise at Goffs, California.* Herpetologica 42: 93-104.

Turner, R.R. 1982. Mohave Desert Scrub. In: D.E. Brown (editor), *Biotic Communities of the American Southwest-United States and Mexico*. Desert Plants 4(1-4): 157-168.

U.S. General Accounting Office (U.S. GAO). 1994. *Ecosystem Management: Additional Actions Needed to Adequately Test a Promising Approach.* Washington, D.C. GAO/RCED-94-111. 87pp.

U.S. Geological Survey (USGS). 1992. *Land Subsidence and Problems Affecting Land Use at Edwards Air Force Base and Vicinity, California, 1990.* Water Resources Investigations Report 92-4035.

USGS. 1993. *Hydrogeology and Land Subsidence, Edwards Air Force Base, Antelope Valley, California, January 1989 – December 1991*. Water-Resources Investigations Report 94-4184.

USGS. 1995a. *Ground-Water-Level Monitoring, Basin Boundaries, and Potentiometric Surfaces of the Aquifer System at Edwards Air Force Base, California. 1992*. Water-Resources Investigations Report 95-4131.

USGS. 1995b. *Land Use and Water Use in The Antelope Valley, California*. Water-Resources Investigations Report.

USGS. 1996. *Time-Series Ground-Water-Level and Aquifer-System Compaction Data, Edwards Air Force Base, Antelope Valley, California, January 1991 through September 1993.* Open-File Report 96-186.

USGS. 1998. *Topography, Surface Features, and Flooding of Rogers Lake Playa, California*.

U.S. Natural Resources Conservation Service (U.S. NRCS). 1996. *Draft Grazing and Cropland Management Plan for Edwards Air Force Base, California.* December.

U.S. NRCS. 1997. *Grazing and Cropland Management Plan.*

United States Air Force (USAF). 1994. *Edwards Air Force Base Comprehensive Plan*, June. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

United States Code (USC)

7 USC 136, et seq., *Federal Insecticide, Fungicide, and Rodenticide Act*.
7 USC 2801, et seq., *Federal Noxious Weed Act.* 1975.
10 USC 2701, *Defense Environmental Restoration Program.*
16 USC 470, et seq., *National Historic Preservation Act*.
16 USC 670a-670o, *Sikes Act* as amended 1997.
16 USC 703-712, *Migratory Bird Treaty Act.*
16 USC 1531-1544, *Endangered Species Act of 1973.*
42 USC 4321, et seq., *National Environmental Policy Act of 1969.*
42 USC 9601, et seq., *Comprehensive Environmental Response Compensation and Liability Act*. 1980.

U.S. Fish and Wildlife Service (USFWS). 1993. *Draft Recovery Plan for the Desert Tortoise (Mojave Population).*

USFWS. 1994a. *Desert Tortoise (Mojave Population) Recovery Plan*. U.S. Fish and Wildlife Service, Portland, Oregon. 73 pages plus appendices.

USFWS. 1994b. *Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Mojave Population of the Desert Tortoise*. Federal Register 59(26): 5820-5866.

USFWS. 1994c. *Biological Opinion for the Precision Impact Range Area, Edwards Air Force Base, California*, (1-8-94-F-6). 10 March. Document on file at Environmental Management (AFFTC/EM), Edwards AFB CA.

USFWS. 1996. *Biological Opinion on Establishment and Continued Use of an Off-Road Vehicle Area at the Air Force Flight Test Center in Kern, Los Angeles and San Bernardino Counties, California*, (1-8-96-F-10).

Weinstein, M.N., K.H. Berry and F.B. Turner. 1987. *An Analysis of Habitat Relationships of the Desert Tortoise in California.* A Report to Southern California Edison Company. Rosemead, California.

Wilbur, H.M., and J.P. Morin. 1988. *Life History Evolution in Turtles*. Pages 387-439 in C. Gans and R.B. Huey (eds.) Biology of Repitilia: Defense and Life History 16(B). A.R. Liss, Inc., New York.

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# APPENDIX A
# MANAGEMENT AREAS

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**Table A-1.**
**Management Areas A to G, Current and Projected Future Land Usage by Management Area at Edwards AFB**

| Subunits/Mission Support | Current Dominant Use | Projected Dominant Use | Highlights of Natural Resources |
|---|---|---|---|
| **Aircraft Overflight Test Area – A** | | | |
| Area surrounding Rod and Gun Club, Camp Corum Area, Buckhorn and Rosamond Dry Lakes; claypans (playas) east of Rogers and south of Rosamond Dry Lakes | Area used as buffer zone around Camp Corum area and from Main Runway; aircraft test and training. Recreation to include hunting and associated activities. | Continued aircraft test, training and operations; buffer zone for adjacent developed areas; designated hunting areas. | Joshua tree woodlands, halophytic-phase saltbush scrub, creosote scrub. Claypan playas are also seasonal flood prone areas. |
| Piute Ponds | Aircraft test, training and operations; impoundment of sewage effluent from off Base treatment plant to maintain Rosamond Dry Lake surface for mission use; waterfowl hunting in man-made ponds; wildlife watching. | Continued aircraft test, training and operations; effluent impoundment; continued outdoor recreation use. | Halophytic-phase saltbush scrub. Artificially maintained habitat for migratory waterfowl (ponds); within County of Los Angeles SEA 50. |
| Mesquite Woodlands | Aircraft test, training and operations. Recreation to include hunting and associated activities | Continued aircraft test, training and operations; recreation to include hunting and associated activities. | Mesquite woodlands are County of Los Angeles SEA 47. |
| Branch Memorial Park and Scout Park | Outdoor recreation associated with family picnic area, fishing, and other recreation uses. | Continued recreational use. | Halophytic-phase saltbush scrub. Branch pond is stocked with bluegill, large-mouth bass and channel catfish. |
| Well Fields | Provide potable and nonpotable water from deep aquifer. | Maintain wells for backup and emergency water supply. | Groundwater. |
| Playas northeast of Rogers Dry Lake | Aircraft test, training and operations. A portion is currently used as a jettison area. | Continued aircraft test, training and operations. | Nonjurisdictional aquatic habitats and flood prone areas. |
| Undeveloped Area North of Mercury Boulevard | Aircraft test, training and operations | Continued aircraft test, training and operations. | Arid-phase saltbush scrub. Tortoise habitat area. Sensitive species include Barstow woolly sunflower, desert cymopterus, Mohave ground squirrel. Yardangs. |
| **Precision Impact Range Area (PIRA) - B** | | | |
| Mt. Mesa | Aircraft test, training and operations; placement of communications equipment; desert tortoise enhancement management area. | Continued aircraft test, training and operations; communications; desert tortoise enhancement management area. | Critical habitat for desert tortoise. Desert tortoise enhancement management area; Creosote bush scrub. |

**Table A-1 (Continued).**
**Management Areas A to G, Current and Projected Future Land Usage by Management Area at Edwards AFB**

| Subunits/Mission Support | Current Dominant Use | Projected Dominant Use | Highlights of Natural Resources |
|---|---|---|---|
| West Range | Aircraft test, training and operations; PIRA; explosive ordnance disposal. | Continued aircraft test, training and operations; PIRA; explosive ordnance disposal | Includes critical and noncritical desert tortoise habitat. Creosote bush scrub. Seasonal flood prone areas. |
| East Range | Aircraft test, training and operations; PIRA; explosive ordnance disposal. | Continued aircraft test, training and operations; PIRA; explosive ordnance disposal. | Critical and other habitat for desert tortoises. Creosote, Joshua tree woodlands, arid-phase saltbush scrub. Seasonal flood prone areas. |
| Precision Bombing 6 | Aircraft test, training and operations; PIRA; explosive ordnance disposal. | Continued aircraft test, training and operations; PIRA; explosive ordnance disposal. | Creosote, Joshua tree woodlands, arid-phase saltbush scrub. |
| Area east of U.S. State Route 395 and south of Hwy. 58 | Aircraft test, training and operations. | Continued aircraft test, training and operations. | Desert tortoise critical habitat Creosote, Joshua tree woodland. |
| **Developed Area – C** | | | |
| Industrial Portion of Main Base and NASA DFRC | Aircraft test, training and operations; developed and undeveloped land, including aircraft operations and maintenance, engineering test, radar sites, and industrial uses; and areas slated for development expansion. | Continued aircraft test, training and operations; engineering test; industrial uses, with areas of new development, demolition, and redevelopment. Construct monitoring wells in portions of this area. | Landscaped vegetation. |
| North Base | Exercise area, industrial, space surveillance; airfield use associated with 6,000-foot runway and clear zones; and undeveloped buffer zone. | Possible extension of runway; maintain buffer zone. | Desert tortoise. Habitat for Mohave Ground Squirrel. |
| South Base Industrial Area | Aircraft test, training and operations; industrial uses; munitions storage; domestic WWTP. | Continued aircraft test, training and operations; ; industrial uses; munitions storage; domestic WWTP. | Scattered arid-phase saltbush scrub, creosote, and Joshua tree woodlands. |
| Family Housing Area | Residential uses associated with family housing units and supporting educational, medical, and recreational. Includes industrial use associated with Base landfill and recycling center. | Continued residential, medical, educational, and recreational. With areas of new development, demolition, and redevelopment. | Scattered arid-phase saltbush scrub, creosote, and Joshua tree woodlands. |

**Table A-1 (Continued).**
**Management Areas A to G, Current and Projected Future Land Usage by Management Area at Edwards AFB**

| Subunits/Mission Support | Current Dominant Use | Projected Dominant Use | Highlights of Natural Resources |
|---|---|---|---|
| Community Support area of Main Base | Developed and undeveloped land, including commercial, unaccompanied residential, educational, administrative, and recreational uses; and areas slated for development expansion. | Continued commercial, unaccompanied residential, educational, administrative, and recreational uses, with areas of new development, demolition, and redevelopment. | Scattered arid-phase saltbush scrub, creosote, and Joshua tree woodlands. |
| **Combat Arms Range – Area D** | | | |
| Combat Arms Range | Undeveloped land used as safety fan for arms range. | Continued use as safety fan. | Halophytic-phase saltbush scrub. Desert tortoise habitat. Mesquite woodlands. |
| **Dry Lakebeds (Flight Test/Runways) Area - E** | | | |
| Rogers Dry Lake | Dry lakebed; aircraft test and training; maintained landing area. | Continue to maintain landing areas; aircraft test and training; | Seasonal invertebrates and microorganisms, migratory birds. |
| Rosamond Dry Lake | Dry lakebed; aircraft test, training and operations; used as unmaintained airfield and drop zone. A portion outgranted for exclusive use as a model airplane airport with support structures. | Continued aircraft test, training and operations; use as unmaintained landing site. | Seasonal invertebrates and microorganisms, migratory birds. |
| Buckhorn Dry Lake | Aircraft test, training and operations; recreation to include hunting and associated activities. A portion is used as a jettison area. | Continued aircraft test, training and operations; hunting in designated areas. | Seasonal invertebrates and microorganisms, migratory birds. |
| **Military Exercise and Test Area - F** | | | |
| Hunting Area | Aircraft test, training and operations; recreation to include hunting and associated activities. | Continued aircraft test, training and operations and recreation to include hunting and associated activities. | Game species. Desert tortoise. Arid-phase saltbush scrub, creosote, and Joshua tree woodlands. |
| ORV Area #2 | Aircraft test, training and operations; outdoor recreation associated with ORV, equestrian trails, and general desert recreation. | Continued aircraft test, training and operations; outdoor recreation. | Arid-phase saltbush scrub, creosote, and Joshua tree woodlands. Desert tortoise habitat. |
| Undeveloped area in the northwest portion of the Base | Aircraft test, training and operations; buffer zone on northwest side of family housing area, stables, landfill, and communication sites. | Continued aircraft test, training and operations; buffer zone for adjacent developed areas. | Arid-phase saltbush scrub, creosote, and Joshua tree woodlands. Mohave ground squirrel habitat. |

**Table A-1 (Concluded).**
**Management Areas A to G, Current and Projected Future Land Usage by Management Area at Edwards AFB**

| Subunits/Mission Support | Current Dominant Use | Projected Dominant Use | Highlights of Natural Resources |
|---|---|---|---|
| **AFRL Area - G** | | | |
| AFRL Test Areas | Rocket motor/engine test areas; fuels storage. | Continued test area and fuels storage. | Creosote scrub, Joshua tree woodlands. Seasonal flood prone areas. Barstow woolly sunflower. |
| AFRL Developed S&T Area | Industrial, science and technology research and development, and administrative uses. | Continued and expanded industrial, research and development, and administrative uses. | Creosote scrub, Joshua tree woodlands. Seasonal flood prone areas. Desert cymopterus. |

Notes: 1. SEA – Sensitive Ecological Area
2. Hwy – Highway
3. NASA DFRC – National Aeronautics and Space Administration Dryden Flight Research Center
4. WWTP – wastewater treatment plant
5. ORV – off-road vehicle
6. AFRL – Air Force Research Laboratory
7. S&T – Science and Technology

# APPENDIX B
# BIOLOGICAL OPINIONS ISSUED FOR ACTIVITIES ON EDWARDS AFB

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# Biological Opinions Issued for Activities on Edwards AFB

1. Propellant Initiation Program at Edwards AFB.....1-6-90-F-19

2. Reinitiation of Formal Consultation for Use of the I-32 and I-36D Test Areas at Edwards Air Force Base, California..... 1-6-90-F-19R

3. Construction Of 115 kV, 34.5 kV, and 20-Inch Water Transmission Lines within a Utility Corridor.....1-6-91-F-6

4. Titan IV Solid Rocket Motor Upgrade, Kern County, California..... 1-6-91-F-16R

5. Proposed Development of Nike Hercules Radar and Cintheodolite Optical Tracker Sites.....1-6-91-F-24

6. Liquid Hydrogen Structural Test Facility.....1-5-91-F-27

7. Routine Operations and Facility Construction within the Cantonment Areas of Main and South Bases, Edwards Air Force Base, California.....1-6-91-F-28

8. Installation of Desert Tortoise-Proof Fencing at the Ridge Facility, Edwards Air Force Base, California .....1-6-91-F-29

9. Construction of an Electrical Distribution System, Edwards Air Force Base, California.....1-6-92-F-18

10. Construction of Three Water Transmission Lines and Two Production Wells, Edwards Air Force Base, California .....1-6-92-F-53

11. Expansion and Upgrade of the Main Base Landfill, Edwards Air Force Base, California.....1-6-92-F-61

12. Proposed Advanced Time-Space Position Information Facility .....1-6-92-F-62

13. Southern California Edison Road Regrade Project, Edwards Air Force Base, California.....1-6-92-F-63

14. Ames-Dryden Flight Research Facility Complex and the National Aeronautics and Space Administration Lease Area of Edwards Air Force Base, California .....1-8-93-F-5

15. Ames-Dryden Flight Research Facility Complex and the National Aeronautics and Space Administration Lease Area of Edwards Air Force Base, California ..... Amend. 1-8-93-F-5

16. Installation and Restoration Program Activities at Main Base, Edwards Air Force Base, California.....1-8-93-F-18

17. Conference Report for Installation and Restoration Program Activities at Phillips Laboratory (AFRL), Edwards Air Force Base, California.....1-8-93-F-23

18. Proposed Pacific Bell Fiber Optic Line from Rosamond to Edwards Air Force Base, California.....1-8-93-F-31

# Biological Opinions Issued for Activities on Edwards AFB (Continued)

19. Proposed Maintenance and Repair of Roads on Edwards Air Force Base, California ..... 1-8-93-F-32

20. Proposed Testing of Soviet RD-170 Engines at Test Stand 1A, Phillips Laboratory (AFRL), Edwards Air Force Base, California ..... 1-8-93-F-33

21. Conference Report for the WSR-88D Radar System (NEXRAD) Project Right-Of-Way Proposal, San Bernardino County, California (CACA-308972895 (CA-068.32)) ..... 1-8-93-F-34

22. Prime Base Emergency Engineering Force Training Area, Edwards Air Force Base, California ..... 1-8-93-F-35

23. Construction of a Utility Corridor from the Town of Boron to Phillips Lab (AFRL), Edwards Air Force Base, California ..... 1-8-94-F-4

24. Expansion of the Land Mobile Radio Communications Network, Edwards Air Force Base, California ..... 1-8-94-F-5

25. Precision Impact Range Area, Edwards Air Force Base, California ..... 1-8-94-F-6

26. Precision Impact Range Area, Edwards Air Force Base, California ..... Amend. 1-8-94-F-6

27. Construction of a Waste Water Treatment Plant and Associated Facilities, Edwards Air Force Base, California ..... 1-8-94-F-10

28. Reinitiation of Formal Consultation for Silo Fire Safety and Space Launch Safety Study Projects, Edwards Air Force Base, California ..... 1-8-94-F-13

29. Installation Restoration Program Activities Associated with the Historic Water Well Program at Edwards Air Force Base, California ..... 1-8-94-F-19

30. Expansion of the Recreational Vehicle Storage Area, Edwards Air Force Base, California ..... 1-8-94-F-23

31. Installation and Restoration Program Activities in South Base, Edwards Air Force Base, California ..... 1-8-94-F-25

32. Air Force Flight Test Center's Underground Storage Tank Program on Edwards Air Force Base, California ..... 1-8-94-F-36

33. Disposal of Two Cylinders of Pentaborane at Edwards Air Force Base, California ..... 1-8-94-F-32

34. Standard Soil Survey at Edwards Air Force Base, California ..... 1-8-94-F-43

35. Expansion of the Base Residential Area, Edwards Air Force Base, California ..... 18-95-F-1

36. Installation Of Underground Communication Lines And Related Facilities On Edwards Air Force Base, California ..... 1-8-95-F-6

## Biological Opinions Issued for Activities on Edwards AFB (Concluded)

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# APPENDIX C
# AN ANNOTATED BIBLIOGRAPHY OF STUDIES BY TAXONOMIC GROUP

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## AN ANNOTATED BIBILOGRAPHY OF STUDIES BY TAXONOMIC GROUP

### Amphibians and Reptiles

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at an Explosive Ordnance Disposal Site, Edwards Air Force Base, California*.

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at a Proposed Drop Zone, Edwards Air Force Base, California*.

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at a Proposed Thermal Treatment Unit, Astronautics Laboratory, Edwards Air Force Base, California*.

AFFTC/EM. 1991. *Biological Assessment of the Installation of Tortoise-Proof Fencing at the Ridge Facility*.

AFFTC/EM. 1991. *Biological Assessment, Vol. 1, A Study of Tortoise Abundance and Habitat, Main and South Base, Edwards Air Force Base, CA*.

AFFTC/EM. 1991. *Biological Assessment for a Natural Gas Line and Electrical Transmission Line Rehabilitation Projects - NASA Ames-Dryden Flight Test Center*.

AFFTC/EM. 1991. *Biological Assessment for Proposed Landfill Expansion, Edwards Air Force Base, California*.

AFFTC/EM. 1991. *Biological Assessment for a Proposed Liquid Hydrogen Structural Test Facility, NASA Ames-Dryden Flight Test Center, Edwards Air Force Base, California*.

AFFTC/EM. 1993. *Biological Assessment of a Portion of the Proposed PG&E Natural Gas Pipeline Near Boron, California*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis.*

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*.

AFFTC/EM. 1996. *Relative Density Estimates of Desert Tortoise on Edwards Air Force Base, California. Final*.

Southern California Edison (SCE). 1989. *Sensitive Species Surveys for the Kramer-Victor 115 kV Transmission Line Rebuild.*

USACOE. 1998. *Off-Road Vehicle Area 2 Baseline Habitat Disturbance Surveys Edwards Air Force Base, California*.

**Birds**

AFFTC. 1995. *Bird Aircraft Strike Hazard Investigation at Edwards Air Force Base, California, July.*

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis*.

AFFTC/EM. 1996. *Military Family Housing Migratory Bird Study Edwards AFB, California.*

AFFTC/EM. 1998. *Survey for and Relocation of Active Migratory Bird Nests at a Military Family Housing Demolition Site at Edwards Air Force Base, California.*

Institute for Raptor Studies. 1981. *Responses of Raptorial Birds to Low-Level Military Jets and Sonic Booms.*

Southern California Edison (SCE). 1989. *Sensitive Species Surveys for the Kramer-Victor 115 kV Transmission Line Rebuild.*

**Desert Tortoise**

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at an Explosive Ordnance Disposal Site, Edwards Air Force Base, California*.

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at a Proposed Drop Zone, Edwards Air Force Base, California*.

AFFTC/EM. 1990. *A Study of Desert Tortoise Abundance and Habitat at a Proposed Thermal Treatment Unit, Astronautics Laboratory, Edwards Air Force Base, California*.

AFFTC/EM. 1991. *Biological Assessment of the Installation of Tortoise-Proof Fencing at the Ridge Facility*.

AFFTC/EM. 1991. *Biological Assessment, Vol. 1, A Study of Tortoise Abundance and Habitat, Main and South Base, Edwards Air Force Base, CA*.

AFFTC/EM. 1991. *Biological Assessment for a Natural Gas Line and Electrical Transmission Line Rehabilitation Projects - NASA Ames-Dryden Flight Test Center*.

AFFTC/EM. 1991. *Biological Assessment for Proposed Landfill Expansion, Edwards Air Force Base, California.*

AFFTC/EM. 1991. *Biological Assessment for a Proposed Liquid Hydrogen Structural Test Facility, NASA Ames-Dryden Flight Test Center, Edwards Air Force Base, California*.

AFFTC/EM. 1993. *Biological Assessment of a Portion of the Proposed PG&E Natural Gas Pipeline Near Boron, California*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*.

AFFTC/EM. 1996. *Relative Density Estimates of Desert Tortoise on Edwards Air Force Base, California. Final*.

Southern California Edison (SCE). 1989. *Sensitive Species Surveys for the Kramer-Victor 115 kV Transmission Line Rebuild.*

USACOE. 1998. *Off-Road Vehicle Area 2 Baseline Habitat Disturbance Surveys Edwards Air Force Base, California*.

**Invertebrates**

AFFTC/EM. 1992. *Study of Freshwater Shrimp at Edwards Air Force Base, California*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*.

Crabtree, C. 1997. *The Ecology of the Clam Shrimp (Eocyzicus digueti) on Edwards AFB, California.*

Pratt, G. 1996. *Terrestrial Invertebrates, Edwards Air Force Base, 1996*.

Pratt, G. 1997. *Terrestrial Invertebrates, Edwards Air Force Base, 1997*.

Pratt, G. 1998. *Butterflies and Moths of the Western Mojave Desert*.

Saddler, M. M. 1963. *The Identification of Desert Shrimp in and Around the Dry Lakes of the Antelope Valley of California*.

Tetra Tech. 1993. *Eubranchiopod Survey Edwards Air Force Base 1992-1993*.

USACOE. 1998. *Ecosystem Model for the Dune/Pan System at Edwards Air Force Base, California. Phase 1: An Ecosystem Study. Draft.*

**Mammals**

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*.

AFFTC/EM. 1995. *Mohave Ground Squirrel Studies at Edwards Air Force Base, California. July.*

AFFTC/EM. 1997. *Population Dynamics and Habitat Characteristics of the Mojave Desert Form of the San Joaquin Pocket Mouse at Edwards Air Force Base, California. April*.

AFFTC/EM. 1998. *Bait Preference Exhibited by Small Mammals at Edwards Air Force Base, California.*

AFFTC/EM. 1998. *Bat Studies at Edwards Air Force Base, California. October*.

Southern California Edison (SCE). 1989. *Sensitive Species Surveys for the Kramer-Victor 115 kV Transmission Line Rebuild.*

Vanherweg, W. J. 2000. *Mohave Ground Squirrel Study at the New OB/OD Site, Edwards Air Force Base, California. Final*.

Vanherweg, W. J. 2001. *Mohave Ground Squirrel Study at the New OB/OD Site, Edwards Air Force Base, California*.

**Vegetation**

AFFTC/EM. 1992. *An Introduction to Plant Communities and Habitats of California Deserts and the Flora and Vegetation of Edwards AFB*.

AFFTC/EM. 1992. *Plant Species of Edwards Air Force Base*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report, Basewide Vegetation and Wildlife Surveys and Habitat Quality Analysis*.

AFFTC/EM. 1993. *Biological Resources Environmental Planning Technical Report Focused Sensitive Species Surveys*.

AFFTC/EM. 1994. *Botanical Resources Study of Complex 1 Charlie, Edwards Air Force Base, CA.*

AFFTC/EM. 1995. *Inventory and Population Characterization Study for Desert Cymopterus at Edwards Air Force Base. December*.

AFFTC/EM. 1995. *Inventory and Population Characterization Study of Barstow Woolly Sunflower.*

AFFTC/EM. 1995. *Inventory and Population Characterization Study of Alkali Mariposa Lily on Edwards Air Force Base. December*.

Smithsonian Institution, 1978. *Interim Technical Report, Endangered and Threatened Plants of Edwards, Eglin and Tyndall AFB*. [Prepared for the U.S. Air Force under AFOSR contract F44620-75-C-0052. March 1978].

Smithsonian Institution, 1978. *Final Scientific Report, Endangered and Threatened Plants of Edwards, Eglin and Tyndall AFB*. [Prepared for the U.S. Air Force under AFOSR contract F44620-75-C-0052. July 1978].

Southern California Edison (SCE). 1989. *Sensitive Species Surveys for the Kramer-Victor 115 kV Transmission Line Rebuild.*

USACOE. 1998. *Ecosystem Model for the Dune/Pan System at Edwards Air Force Base, California. Phase 1: An Ecosystem Study. Draft*.

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# APPENDIX D
# GENERAL INTEGRATED PEST MANAGEMENT PRACTICES

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## DEPARTMENT OF DEFENSE INTEGRATED PEST MANAGEMENT PROGRAM

Integrated Pest Management (IPM) is an approach to pest control that utilizes routine monitoring to determine if pest control measures are necessary. Integrated Pest Management employs mechanical, physical, cultural, biological, and educational methods to maintain pests at populations low enough to prevent undesirable damage or annoyance. Application of least-toxic chemical applications is utilized as a last resort. In implementing IPM programs, predetermined or regular treatments/applications are not conducted. Pest control measures are implemented only when monitoring determines that a pest will cause unacceptable economic, medical, or aesthetic damage if not treated. Treatments are chosen and scheduled to be the most effective and least disruptive form of natural pest control.

Under an IPM program, execution of individual pest management practices involves the following steps:

1. Identify pest
2. Develop plan/strategy
3. Establish action thresholds
4. Monitor pest population
5. Control pest (optional)
6. Document results
7. Evaluate/redesign plan.

The following general IPM practices should be incorporated into the overall pest management program at Edwards AFB, as applicable.

### Turf Management

1. Hand-pull weeds or use a mechanical trimmer (weed-whacker) instead of spraying herbicides, wherever possible.

2. Consult with the local extension service to identify weed-resistant and insect-resistant turf types suitable for your area, or use ground covers other than turf that provide a presentable appearance and are less susceptible to weeds than turf.

3. Improve turf health through a program of fertilization, aeration, irrigation, and increased mowing height to promote resistance to weeds, disease, and insects.

4. When herbicides are applied, use spot treatment instead of broadcast spraying.

5. Apply postemergent herbicides when weeds are small and most vulnerable.

6. Use herbicides that contain a low percentage of active ingredients (AI) or have a low application rate of AI per acre.

7. Consult with the local extension service agent for expert advice on soil testing, herbicide formulations, and application regimens.

8. Do not apply herbicides during times of high stress for weeds, such as drought or freezing conditions, when the weeds go into a dormant phase, because the herbicides will not be as effective.

9. Try to promote an increased tolerance of weeds in some turf areas as part of an overall pollution prevention awareness, emphasizing the reduction in application of chemicals.

**Bare Ground and Fence-Line Control**

1. In ornamental beds, weed and mulch or use geotextile weed barriers for maintenance.

2. Cease weed control in selected areas, such as campgrounds and other small areas where a natural appearance is acceptable and weeding is not necessary.

3. Do not apply herbicides during times of high stress for weeds, such as drought and freezing conditions, when the weeds go into a dormant phase, because the herbicides will not be as effective.

4. Use a scraper or other mechanical method to remove vegetation in areas such as campgrounds, weapons storage areas, athletic fields, training areas, and around stables.

5. Create a mow strip or mulch strip along fence lines.

6. Pave or fill in cracks in parking lots and flightline pavements to reduce occurrence of vegetation.

**Invasive Species**

1. Use grass carp in states where they are legal.

2. Divert nutrient-laden runoff (from leach fields and fertilizers) away from water retention ponds.

3. Use slow-release nitrogen sources and control application of fertilizers and other plant nutrients upgradient of water sources.

**Fungicides**

1. Have a laboratory test soil samples from the golf courses to analyze the specific types of fungus present, and make recommendations regarding the suite of fungicides currently used. Not all may be necessary.

2. Improve turf health and resistance to disease through fertilization, aeration, irrigation, and increased mowing height.

3. Consult with the local extension service to identify turf types that are more disease-resistant and suitable for your area, or use other ground covers and native vegetation that are more disease resistant than turf.

**Outdoor Insects**

1. For aphids, use a water or soap/water spray only.

2. Use plant foods that repel insects on roses and other ornamentals.

3. For bees, wasps, and hornets, apply a soap (dishwashing soap) and water mixture from a hand-held pressure sprayer on insects and hives.

4. Call a local beekeeper to remove beehives.

5. For bagworms, pick the insects off plants.

6. For scale insects (sucking insects with shell coverings, related to aphids), use dormant oil only if it can be applied at the correct developmental phase.

7. Encourage natural predators; such as birds and bats, by placing bird and bat houses in outdoor areas where flying insects are a problem (away from flightline areas).

8. Use traps for flies and bees.

9. Eliminate areas of standing water that may provide habitat for breeding mosquitoes.

10. Vary the chemicals used to control mole crickets to inhibit their resistance to chemicals.

11. Replace ornamentals that are attractive to pests with other varieties.

12. Physically remove fall webworm nests from trees.

**Indoor Insects**

1. Seal/caulk cracks and crevices in structures to keep out ants, roaches, and other insects.

2. Use baits and gels for ants and roaches.

3. Use a fly swatter.

4. Use heat treatment to kill roaches; follow up with sticky traps to monitor recurrence and treat when population increases above tolerable levels (instead of routine treatment).

5. Vary the chemicals used to control roaches to inhibit their resistance to chemicals.

6. Use insect growth regulators to control cockroaches and to keep pets from becoming infested with fleas.

7. Keep food products and food wastes in tightly sealed containers to discourage ants and roaches.

8. Use boiling water to destroy ant mounds.

9. Use a boric acid product to control ants and cockroaches.

**Golf Course Turf**

1. Implement public participation programs, such as 'adopt-a-hole', among base organizations and local youth groups to assist in weeding, trimming, and other maintenance activities on the courses to maintain healthy turf and minimize the need for pesticides.

2. Use natural vegetation and other ground covers instead of turf in some areas of the rough.

**General Pest Management**

1. Use surfactants and adjuvants as recommended on the label to increase the effectiveness of any chemical pesticides and to reduce the amount of AI.

2. Ask for trial demonstrations by product manufacturer representatives to be sure the recommended treatment is appropriate for the specific conditions at a base.

3. Continue to research new products that are in the development and testing stages.

4. The Self-Help Store on base should stock products with low percentages of active ingredients.

5. The Self-Help Store should provide advice for residents regarding lawn care, such as recommending a regimen of fertilization, proper grass height, and aeration for lawns, to decrease the necessity for herbicide applications.

# APPENDIX E
# EXOTIC PLANT SPECIES FOUND ON EDWARDS AFB

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# EXOTIC PLANTS FOUND ON EDWARDS AIR FORCE BASE

## CALIFORNIA EXOTIC PEST PLANT COUNCIL (CALEPPC)

Pest Ratings of Noxious Weed Species and Noxious Weed Seed, published by the State of California, Department of Food and Agriculture, Division of Plant Industry. The Food and Agricultural Code of California (Div. 4, Chap. 1, Art. 1 Sec. 5004) defines a noxious weed as "any species of plant which is, or is liable to be detrimental or destructive and difficult to control or eradicate." Weeds rated as A are designated for eradication, quarantine, or other holding action at the State or count level. Quarantine interceptions are to be rejected or treated at any point in the State.

There is currently a list of 27 A-rated weeds designated for eradication, control or containment with the State.

California Exotic Pest Plant Council A-rated species found on Edwards Air Force Base.

*Centaurea squarrosa*/Squarrose knapweed

*Peganum harmala*/Harmel or African Rue

### CALEPPC LIST A-1: WIDESPREAD AND AGGRESSIVE WEEDS THAT DISPLACE NATIVES IN MORE THAN ONE JEPSON REGION

*Arundo donax*/giant reed/Riparian areas

*Bromus techtorum*/cheat grass/Sagebrush understory

*Tamarix spp*/tamarisk, salt cedar/Desert washes, riparian areas

### CALEPPC LIST B: WILDLAND WEEDS OF SECONDARY IMPORTANCE

*Lepidium perfoliatum*/perennial pepperweed/Coastal and inland marshes

*Salsola tragus(=S. kali*)/Russian thistle, tumbleweed/dry sandy areas

### CALEPPC LIST B: WILDLAND PEST PLANTS OF LESSER INVASIVENESS

*Bassia hyssopifolia*/Bassia/Alkaline habitats

*Centaurea melitensis*/tocalote, Malta star-thistle/Widespread

**CALEPPC NEED MORE INFORMATION LIST**

*Descurainia sophia*/flixweed, tansy mustard/washes

**CALEPPC EXOTIC ANNUAL GRASS LIST**

*Schismus arabicus/* Arabian Grass/shrublands

*Schismus barbatus/* Split Grass/shrublands

**CALEPPC EXOTIC CONSIDERED, BUT NOT LISTED**

*Xanthium spinosum*/spiny cocklebur/restricted to disturbed areas

# EXOTIC WEEDS BY AREA OF ORIGIN KNOWN TO OCCUR ON EDWARDS AFB

## 1. Asian

| | |
|---|---|
| *Ambrosia acanthicarpa* Hooker | BUR-WEED |
| *Cardaria pubescens* (C. A. Meyer) Rollins. var. *elongata* | WHITETOP |
| *Centaurea squarrosa* Willd | WHITE STAR-THISTLE |
| *Tamarix ramosissima* Ledebour | SALT CEDAR |

## 2. Europe

| | |
|---|---|
| *Avena barbata* Brotero | SLENDER WILD OATS |
| *Chenopodium rubrum* (Linnaeus) | RED LAMB'S QUARTER |
| *Chenopodium murale* Linnaeus | GOOSEFOOT |
| *Mollugo cerviana* (Linnaeus) Seringe | INDIAN CHICKWEED |
| *Panicum capillare* Linnaeus var. *occidentale* Rydberg | PANIC GRASS |
| *Plantago major* Linnaeus | COMMON PLANTAIN |
| *Polygonum arenastrum* Boreau | COMMON KNOTWEED |
| *Senecio vulgaris* Linnaeus | COMMON GROUNDSEL |
| *Sisymbrium orientale* Linnaeus | EASTERN ROCKET |
| *Sonchus oleraceus* Linnaeus | SOW-THISTLE |
| *Sonchus asper* (Linnaeus) Hill | LEAFY or PRICKLY SOW-THISTLE |

## 3. Eurasia

| | |
|---|---|
| *Arundo donax* Linnaeus | GIANT REED |
| *Brassica geniculata* (Desfontianes) J. Ball | BIENNIAL MUSTARD |

| | |
|---|---|
| *Bassia hyssopifolia* (Pallas) Kuntze | FIVE-HOOK BASSIA |
| *Brassica nigra* (Linnaeus) Koch | BLACK MUSTARD |
| *Bromus tectorum* Linnaeus | DOWNY BROME or CHEAT GRASS |
| *Bromus diandrus* Roth | RIP-GUT BROKE |
| *Bromus rubens* Linnaeus | RED BROME |
| *Capsella bursa-pastoris* (Linnaeus) Medicus | SHEPARDS-PURSE |
| *Centaurea melitensis* Linnaeus | YELLOW STAR-THISTLE |
| *Centaurea repens* Linnaeus | RUSSIAN KNAPWEED |
| *Convovulus arvensis* Linnaeus | FIELD BINDWEED |
| *Descurainia sophia* (Linnaeus) Webb | TANSY-MUSTARD |
| *Erodium cicutarium* (Linnaeus) L'Heritier de Brutelle | RED-STEM FILAREE |
| *Hordeum glaucum* Steudel | FOXTAIL BARLEY |
| *Hordeum leporinum* Link | FARMER'S FOXTAIL |
| *Hordeum vulgare* Linnaeus | COMMON BARLEY |
| *Hymenolobus procumbens* (Linnaeus) Nuttall ex. Torrey and Gray. [*Hutchinsia* (P. Linnaeus) Desvaux.] | HUTCHINSIA |
| *Lactuca serriola* Linnaeus (*L. sativa* L.) | PRICKLY LETTUCE |
| *Lepidium perfoliatum* Linnaeus | SHIELD-CRESS |
| *Malva neglecta* Wallroth. *(M. parviflora* Linnaeus) | CHEESEWEED |
| *Marrubium vulgare* Linnaeus | HOREHOUND |
| *Medicago sativa* Linnaeus | ALFALFA |
| *Peganum harmale* Linnaeus | AFRICAN RUE |
| *Poa annua* Linnaeus | ANNUAL BLUEGRASS |

| | |
|---|---|
| *Polypogon monspeliensis* (Linnaeus) Desfontianes | RABBITS FOOT or BEARD GRASS |
| *Portulaca oleracea* Linnaeus | PURSLANE |
| *Rumex crispus* Linnaeus | CURLY DOCK |
| *Salsola australis* M. Brown (*S. kali* Linnaeus and *S. ibercia* Sennen and Pav.) | TUMBLEWEED or RUSSIAN THISTLE |
| *Salsola paulensii* Litvinov | BARB-WIRE TUMBLEWEED |
| *Sisymbrium altisissimum* Linnaeus | TUMBLE-MUSTARD |
| *Solanum nigrum* Linnaeus. var. *nigrum* | BLACK NIGHTSHADE |
| *Spergularia marina* (Linnaeus) Grisebach | SAND SPURREY |
| *Tamarix aphylla* (Linnaeus) Karsten | ATHEL TREE |
| *Triticum aestivum* Linnaeus | WHEAT |
| *Typha angustifolia* Linnaeus | NARROW-LEAVED CATTAIL |
| *Xanthium spinosum* Linnaeus | SPINY CLOTBUR or COCKLEBUR |

**4. South American**

| | |
|---|---|
| *Conyza bonariensis* (Linnaeus) Cronquist | SOUTH AMERICAN HORSEWEED |
| *Tribulus terrestris* Linnaeus | PUNCTURE-VINE |

**5. Africa**

| | |
|---|---|
| *Brassica tournefortii* Gouan | SAHARA MUSTARD |
| *Schismus barbatus* (Linnaeus) Thellung | SPLIT GRASS |
| *Schismus arabicus* Nees von Esenbeck | ARABIAN GRASS |

**6. Mediterranean**

| | |
|---|---|
| *Tamarix parviflora* de Candolle | FOUR-PETALED TAMARISK |

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# APPENDIX F
# DEFINITION OF TERMS

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## DEFINITION OF TERMS

**Agricultural Outleasing**–The use of DoD lands under a lease to an agency, organization, or person for growing crops or grazing animals.

**Alluvial Fan**–A cone shaped stream of erosional debris, consisting chiefly of coarse boulder to gravel-sized sediment, issuing from the canyon mouths of mountains in arid to semiarid climatic regimes.

**Bajada**–The extensive ramps leading up to desert mountain ranges that are composed primarily of coalescing alluvial fans. Sometimes called piedmonts.

**Biological Diversity**–The variety of life forms, the ecological roles they perform, and the genetic variability they contain within any defined time and space.

**Caliche**–Cement-like layers of calcium carbonate that occur at depths of a few centimeters to several meters below the ground surface.

**Cenozoic**–That epoch in Earth's history between about 65 million years ago and the present. It was during the middle of this period that the Basin began, leading to the present, distinct physiography of this region. The Tertiary occupies the greatest part of the Cenozoic (65 to 1.7 million years ago), while the Quaternary spans the last 1.7 million years.

**Critical Habitat**–Any air, land, or water area (excluding existing synthetic structures or settlements that are not necessary to the survival and recovery of a listed species) and constituents thereof that the Fish and Wildlife Service has designated as essential to the survival and recovery of an endangered or threatened species or a distinct segment of its population.

**Cropland**–Land primarily suitable for producing farm crops, including grain, hay, and truck crops.

**Ecosystem Management**–An approach to natural resources management that focuses on the interrelationships of ecological processes linking soils, plants, animals, minerals, climate, water, and topography. Managers view such processes as a living system that affects and responds to human activity beyond traditional commodity and amenity uses. They also acknowledge the importance of ecosystem services such as water conservation, oxygen recharge, and nutrient recycling. Generally, management that is over a large area, considering several species, as opposed to single-species management.

**Endangered Species**–Any plant or animal listed or proposed for listing as threatened or endangered by the Federal Government or State governments, usually because of the species' imminent danger of extinction.

**Exotic Species**–Any plant or animal not native to a region, state, or country. (This definition excludes certain game species that have become established.)

**Floodplains**–Lowland or flat areas adjoining inland and coastal waters, including flood-prone areas on offshore islands, that have a 1 percent or greater chance of flooding in any given year.

**Forest Management**–Developing, conserving, and protecting forest resources to ensure that they provide sustained yield and multiple uses.

**Game**–Any species of fish or wildlife for which State or Federal laws and regulations prescribe seasons and bag or creel limits.

**Grazing Land**–Land with vegetative cover that consists of grasses, forbs, and shrubs valuable as forage.

**Habitat**–An area that provides the environmental elements of air, water, food, cover, and space necessary for a given species to survive and reproduce.

**Highly Erodible Soils**–Soils that, because of their physical properties or slope, the U.S. Department of Agriculture Soil Conservation Service identifies as being highly susceptible to wind or water erosion.

**Improved Grounds**–Grounds on which personnel annually plan and perform intensive maintenance activities. These are developed areas of an installation that have lawns and landscape plantings that require intensive maintenance. They usually include the urban areas, parade grounds, athletic areas, golf courses (excluding roughs), and industrial areas.

**Integrated Natural Resources Management Plan**–A natural resources management plan based on ecosystem management that shows the interrelationships of the individual component plans as well as mission and land use activities affecting the basic land management plans.

**Management Areas**–The smallest land management division that planners use in developing specific strategies to accomplish natural resources management goals.

**Metadata**−Metadata is frequently described as data about data. It is additional information (besides the spatial and tabular data) that is required to make the data useful. Metadata represents a set of characteristics about the data that are normally not contained within the data itself. Metadata could include an inventory of existing data, definitions of the names and data items, documentation of the data structures and data models used, and a record of the steps performed on the data including how it was collected.

**Multiple Use**–The integrated, coordinated, and compatible uses of various natural resources to derive the best benefit while perpetuating and protecting those resources.

**Multiple Use and Sustained Yield Management**–The care and use of natural resources so as to best serve the present and future needs of the United States and its people without impairing the productivity of the land and water. It's acknowledgement of more than one possible use and allows resources a greater chance of persistence over time.

**Outdoor Recreation**–Recreation that relates directly to and occurs in natural, outdoor environments.

**Outdoor Recreation Resources**–Areas and associated natural resources that are provided, or have the potential to provide, opportunities for outdoor recreation for present and future generations.

**Playa**–Expanses of nearly flat, alkaline silts that occupy the bottom of most closed desert valleys. They support no vegetation, and present a particularly bleak appearance. Also known as salt pans and dry lakes

**Farmland**–Land that has the combination of chemical and physical characteristics for producing food, feed, forage, fiber, and oil-seed crops and is also available or potentially available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops under modern farming methods.

**Rangeland**–Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. It includes lands revegetated naturally or artificially to provide a forage cover that is managed similar to native vegetation.

**Recreation Carrying Capacity**–The level of recreational use that an area can sustain without damage to the environment.

**Semi-improved Grounds**–Grounds where personnel perform periodic maintenance primarily for operational and aesthetic reasons (such as erosion, dust and bird control, and visual clear zones). These usually include grounds adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; picnic areas; ammunition storage areas; antenna facilities; and golf course roughs.

**Stewardship**–The management of a resource Base with the goal of maintaining or increasing the resource's value indefinitely into the future.

**Threatened Species**–Those Federally or State listed species of flora and fauna that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range and that have been designated for special protection and management pursuant to the Endangered Species Act.

**Unimproved Grounds**–Grounds not classified as improved or semi-improved and usually not mowed. These include weapons ranges; forestlands; lakes, ponds, and wetlands; and areas in airfields beyond the safety zones.

**Urban Forests**–Planted or native tree species existing within urbanized areas such as parks, tree-lined residential streets, scattered tracts of undisturbed woodlands, and cantonment areas.

**Urban Wildlife**–Wildlife that habitually live or periodically survive in an urban environment on improved or semi-improved grounds.

**Wetlands, Biological**–Areas inundated or saturated by surface or ground water at a frequency and a duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

**Wildlife Carrying Capacity**–The maximum density of wildlife that a particular area or habitat can carry on a sustained basis without deterioration of the habitat.

# APPENDIX G
# AIR FORCE AIR INSTALLATION COMPATIBLE USE ZONE (AICUZ) REQUIREMENTS

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File 22- AICUZ

**DEPARTMENT OF THE AIR FORCE**
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

10 JAN 1994

FROM: HQ AFMC/CEPL
4225 Logistics Ave., Ste 7
Wright-Patterson AFB OH 45433-5745

SUBJ: AICUZ Noise Contours (Your Ltr, 18 Nov 93)

TO: AFFTC/XRX
1 South Rosamond Blvd
Edwards AFB CA 93524-1033

1. We have reviewed the noise contours created in NOISEMAP, which were produced by AFCEE/DGP and validated by your office. We agree that the 65 Ldn contour, as provided, is wholly contained within the Edwards AFB boundary; as such, the exemption from the requirement to publicly release a full AICUZ study remains in effect. With the validation of these contours, you are approved to release the contours to local governments for planning purposes.

2. As the 65 Ldn contour is less than one mile from the base boundary, we request that the data be revalidated in 1995, or earlier in the event of a major change in flying operations. Although the revalidation may be accomplished via a required EIAP action associated with a mission change or change in flying operations, the decision whether to publicly release an AICUZ study must be considered separately by this office.

3. We request that you forward for our files, copies of the aircraft operations summary which detail the operations and aircraft types which produced the contours. We also request that these contours be forwarded to 650 ABW/CEEV for overlay on the appropriate Base Comprehensive Plan (BCP) maps, and that copies of these maps also be forwarded to our office.

4. Any questions regarding the AICUZ program, may be forwarded to Mr. Frank Tokarsky, CEPL, DSN 787-2433.

Ralph F Daniels

RALPH F. DANIELS
Chief, Plans and Programs Branch
Directorate of Civil Engineering

cc: 650 ABW/CEEV
HQ USAF/CEVP
AFCEE/DGP

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# APPENDIX H
# SUMMARY OF GOALS AND OBJECTIVES

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# Summary of Goals and Objectives

## Natural Resource Management Goals

Preceding sections of this INRMP have described the natural resources at Edwards AFB and the ongoing and planned mission activities that may affect those resources. Individual management plans have been developed to ensure that mission activities are planned and conducted in a manner that considers and conserves natural resources on Base. Altogether, these plans and management strategies have been designed to meet the overall goal of Natural Resource Management at Edwards AFB, which is to fulfill the defense mission while maintaining and enhancing natural resources on Base through ecosystem management.

The INRMP highlights the major focus areas that have been identified as priorities for natural resources management activities and funding. The following have been identified as primary goals and objectives of the natural resource management program at Edwards AFB.

## Section 5: Threatened and Endangered Species Management Plan

**Management Goals and Objectives.** The Environmental Management Directorate intensely manages activities on Base that may impact listed species, specifically desert tortoise. Management activities include habitat conservation, monitoring, focused surveys and studies, and analysis of impacts under NEPA, as approved, and subject to appropriation by Congress. The desert tortoise educational program has also proven to be an effective tool that facilitates ESA compliance.

*Key Issues/Goals*

***Habitat loss/rehabilitation, predation/direct mortality, disease, exotic species, population status data, and education.***

**Goal: Conserve desert tortoise habitat.**

> **Objective 1.** Review all project activities under NEPA to minimize loss of desert tortoise habitat.
>
> **Objective 2.** Revegetate unused/unnecessary motor vehicle routes and other disturbed areas. Continue to track any loss of habitat for future restoration/revegetation efforts and incorporate this data into the GIS layer. Priority is given to Critical Habitat.
>
> **Objective 3**. Maintain limited access to desert tortoise habitat areas. Install and maintain the Base perimeter fence with a focus on Critical Habitat areas.
>
> **Objective 4**. Develop a programmatic BO for routine actions on Edwards AFB.

**Goal: Maintain or increase desert tortoise population in areas that have a high potential to support desert tortoise populations.**

**Objective 1**. Support predation and mortality studies.

**Objective 2.** Develop and implement predator control plans as appropriate.

**Objective 3.** Support ongoing efforts to determine heavy metal uptake impacts to desert tortoise populations.

**Objective 4.** Document observations of disease as required by the BOs. When necessary to take a desert tortoise to the veterinarian, a sample shall be taken for a full disease screening.

**Objective 5**. Effectively manage movement patterns and desert tortoise relocation practices.

**Objective 6.** Install exclusion fencing around high-risk areas and eliminate other hazards that pose a risk to desert tortoise populations.

**Goal: Reduce impacts of exotic/pest species on the desert tortoise.**

**Objective 1.** Identify the number, location, and abundance of exotic plant species on Edwards AFB that have the potential to impact the desert tortoise.

**Objective 2.** Include actions in the Integrated Pest Management Plan for the eradication of exotic/pest species potentially impacting the desert tortoise.

**Goal: Monitor desert tortoise population.**

**Objective 1.** Survey the approximately 150 established desert tortoise transects per USFWS protocol. Conduct surveys over a maximum period of 5 years (20 percent per year) for the tenure of the recovery plan.

**Objective 2**. Based on survey results, implement adaptive management to enhance desert tortoise population.

**Objective 3**. Conduct project compliance monitoring as required.

**Goal: Promote and participate in regional planning for desert tortoise conservation.**

**Objective 1**. Participate in the Desert Manager's Group to include the Science Data Management Team.

**Objective 2**. Support the Mojave Desert Ecosystem Program to provide expanded management options and the best available technical knowledge for the management of the desert tortoise.

**Objective 3.** Participate in the development and support the initiatives of the WMDP that are consistent with the mission of Edwards AFB.

**Goal: Conduct education and training program**.

**Objective 1.** Conduct desert tortoise program including awareness, project management, and project specific levels.

**Objective 2**. Ensure Edwards AFB professional staff receives endangered species management and technical training.

**Objective 3.** Develop, distribute, and present educational materials such as fact sheets, pamphlets, handbooks, educational displays, videos, and briefings, to educate Base personnel and the community regarding the problems, issues, and process of conserving the desert tortoise on Edwards AFB.

**Objective 4.** Continue the desert tortoise adoption program for Base employees to minimize the potential for unauthorized removal of tortoises from natural populations and releases of potentially diseased tortoises into the wild.

## Section 6: Fish and Wildlife Management Plan

**Management Goals and Objectives.** The Environmental Management Directorate actively manages activities on Base that may impact sensitive nonlisted species, species under regulatory review, and birds protected under the *Migratory Bird Treaty Act*. Management activities include focused surveys, consideration of impacts to sensitive species in the EIAP, and minimization of project impacts through avoidance and/or other forms of enhancement (revegetation and habitat replacement).

Management of fish and wildlife has multiple objectives that include addressing opportunities for effective management of wildlife populations. Rather than focusing on individual species, management efforts have been and will continue to be focused on conservation, restoration, protection, and enhancement of habitats. Fish and wildlife management includes passive management such as on- and off-Base education, and active management, which includes control of nuisance species, habitat management for reduction of BASH, and desert revegetation. Fish and wildlife management practices have been and will continue to be applied to maximize and maintain fishing and hunting programs on Base (see section 1 for the public access policy).

***Key Issues/Goals***

*Habitat loss/rehabilitation, biodiversity conservation, populations' status, migratory birds, education, and exotic species*

**Goal: Reduce habitat loss.**

**Objective 1.** Review all project activities to minimize their impacts to natural resources.

**Objective 2.** Site all projects within previously disturbed areas to the greatest extent possible.

**Objective 3.** Restore selected habitats that have been disturbed.

**Objective 4.** Review and analyze revegetation projects to determine levels of success and the cost benefit of different restoration procedures.

**Objective 5.** Provide high quality stocks of locally adapted seed and plants to support revegetation projects.

**Goal: Conserve biodiversity on Base.**

**Objective 1.** Integrate management practices that restore and enhance wildlife and plant populations and their habitats.

**Objective 2.** Conduct Baseline inventories and updates of wildlife and plant species.

**Objective 3.** Participate in regional activities to include the Desert Manager's Group and the Mojave Desert Ecosystem Program to provide expanded management options and the best available technical knowledge for the management of natural resources.

**Objective 4.** Conserve aquatic habitats to maintain ecosystem functions (to include maintenance of the lakebed surface for mission support).

**Objective 5.** Continue to promote programs that enforce conservation of natural resources on Base (to include ORV, hunting and fishing, and education).

**Goal: Monitor listed and sensitive species.**

**Objective 1**. Use long-term plots and selected sites to monitor population size and distribution**.**

**Objective 2.** Confer with the USFWS and CDFG on sensitive species that may be proposed for listing.

**Objective 3.** Document habitat requirements for listed and sensitive nonlisted species.

**Objective 4.** Support the intent of the migratory bird conventions (E.O. 13186).

**Objective 5.** Use inventory and monitoring data to implement an adaptive management strategy.

**Goal: Promote and provide educational opportunities for the Edwards AFB natural resources program.**

**Objective 1.** Provide information to Edwards AFB personnel and selected surrounding communities to improve the understanding of Edwards AFB's mission and natural resources stewardship efforts.

**Objective 2.** Take advantage of available technology to enhance natural resources educational outreach.

**Objective 3.** Support requests from local youth groups and schools to encourage natural resources conservation.

**Objective 4.** Support efforts to author/coauthor papers for scientific journals presenting research/project results.

**Exotic species—see Pest Management Key Issues/Goals and objectives in section 9.**

## Section 7: Forestry Management

***Key Issues/Goals***

*Prevent habitat loss, exotic species control, and individual plant preservation.*

**Goal: Conserve mesquite woodlands and Joshua trees.**

**Objective 1.** Encourage in place preservation of Joshua trees where feasible.

**Objective 2.** Remove and transplant Joshua trees displaced as a result of construction or disturbance to more desirable locations when feasible.

**Objective 3.** Eradicate exotic species from mesquite woodlands and Joshua tree woodlands, especially in high-density endangered species habitat.

**Goal: Support urban forestry through xeriscaping/landscaping efforts.**

**Objective 1.** Promote xeriscape/desert-compatible species to reduce stress on water resources. Reduction of water use will benefit water-dependent woodlands by providing more available groundwater.

**Objective 2.** Consult with Civil Engineering on the planting of native tree species, shrubs, and perennial plants when landscaping the urban areas.

**Objective 3.** Identify nonnative landscape trees in urban areas and other disturbed locations that could be replaced.

**Objective 4**. Encourage/promote soil conservation through windbreak tree planting effort.

**Objective 5.** Support initiatives to eliminate tree planting near taxiways to minimize BASH.

**Goal: Exotic species control** (see section 9 goals).

## Section 8: Grazing and Cropland Management Plan

**Management Goals and Objectives.** The Environmental Management Directorate actively monitors the Base for unauthorized use. Management activities include installed fencing, limited access, and enforcement of Base policies.

*Key Issues/Goals*

*Grazing of domestic animals.*

**Goal: Prevent the unauthorized use of Edwards AFB for grazing.**

**Objective 1**. Coordinate with Civil Engineering to maintain the Base perimeter fence which discourages domestic grazing animals from entering the Base.

**Objective 2.** Monitor and report sightings of domestic grazing animals to the Base security forces.

**Goal: Restrict agriculture use on Edwards AFB.**

**Objective 1.** Review all projects and proposals via the NEPA process.

## Section 9: Pest Management Plan

***Key Issues/Goals***

*General pest and exotic species control, and biodiversity conservation.*

**Goal: Control pests and exotic species.**

**Objective 1.** Comply with all Federal, State, and local laws and regulations pertaining to pest management and pesticide use, to include ensuring contractor personnel are State-certified applicators.

**Objective 2.** Inventory and map the distribution and abundance of nonnative, invasive species (*e.g.*, *Tamarix ramosssissima, Salsola tragus*).

**Objective 3.** Develop species-specific management plans for priority species.

**Objective 4.** Review and evaluate plans and make adaptive management adjustments.

**Goal: Implement IPM.**

**Objective 1.** Maximize safety and minimize pesticide use and potential hazards to humans, wildlife and their environments.

**Objective 2.** Annually review the Pest Management Plan and incorporate updates into the plan on a 5-year cycle.

**Goal: Biodiversity conservation.**

**Objectives 1.** Prevent the introduction of noxious plant and animal species to the Base to the greatest extent possible.

**Objective 2.** Prioritize sensitive areas that require invasive plant management.

**Objective 3.** Eradicate priority exotic species.

**Goal: Effectively control health and safety related pest issues.**

**Objective 1.** Educate Base personnel on proper disposal of unused food items and other refuse.

**Objective 2.** Place tarpaulins over trash in vehicles that haul material to the landfill.

**Objective 3.** Cover the active area of the landfill with at least 6 inches of soil during daily operations and at the end of the day to reduce the site's attractiveness to pest species such as coyotes and ravens.

**Objective 4.** Educate Base personnel on exotic plant and animal species impacts to the environment.

## Section 10: Land Management Plan

***Key Issues/Goals***

***Effective planning, land usage, water resources, and cultural resources impacts.***

**Goal: Effectively manage land use issues.**

**Objective 1.** Use the best available information and technology in making decisions.

**Objective 2.** Implement adaptive management through a long-term monitoring program.

**Objective 3.** Support public involvement, open communication, and incorporation of public concerns into the management decision process.

**Goal: Manage for sustainability.**

**Objective 1.** Provide long-term effective and efficient use of land Base resources to support the Air Force mission.

**Objective 2.** Use the NEPA process to minimize impacts of flooding on the mission.

**Goal: Conserve aquatic resources**

**Objective 1.** Review project plans to ensure drainage patterns are not changed in areas where listed or sensitive species occur (alkali mariposa lily).

**Objective 2.** Actively manage aquatic vegetation to conserve species diversity.

**Objective 3.** Conduct Baseline inventories and ecological function studies of aquatic dependent species.

**Goal: Promote water conservation and reuse.**

**Objective 1.** Develop measures through the NEPA process to encourage water conservation.

**Objective 2.** Maximize use of reclaimed water for aquatic habitats.

**Objective 3.** Study feasibility of increased use of gray water for recreational water impoundments

**Objective 4.** Continue the use of gray water to enhance recreational opportunities.

**Goal: Integrate natural and cultural resources management practices.**

**Objective 1.** Consider natural resources when planning cultural resources projects.

**Objective 2.** Consider cultural resources when planning natural resources projects.

## Section 11: Outdoor Recreation Management Plan

***Key Issues/Goals***

*Recreation.*

**Goal: Support quality of life.**

**Objective 1.** Manage outdoor recreation consistent with needs of the Edwards AFB military mission.

**Objective 2.** Integrate recreation activities with natural resources stewardship and compliance.

**Objective 3.** Control access to Edwards AFB for natural resources recreation in accordance with Edwards AFB policies.

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